

ASTRONOMY

delights

Magda Brits Streicher

Astronomy Delights 2020

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FOREWORD

Astronomy is an observational science. At least, it should be. Professional astronomy has moved on from that premise to such a degree that it has lost practically all resemblance to the gentle art practiced in antiquity and as recently as the eras of Edwin Hubble and Halton Arp. Thank heavens for the amateurs! And thanks most especially for those dedicated humble souls spending painful lonely hours in remote places, gazing ever skywards in the hope of seeing something different. Or perhaps just more detail in familiar things. Such a person is my dear friend Magda Streicher, who has in this book made an anthology of observations acquired over many years of dedicated and patient sky-watching.

A few years ago, I happened to remark to a friend in ASSA that the cost of belonging to the society was more than repaid by the joy one gets from Magda's "*Astronomy Delights*" column in MNASSA. He passed my letter on to her, and thus began a correspondence and a friendship that has never wavered.

Magda doesn't photograph; she sketches. That to me encapsulates the kind of approach she has. To say that she's hands-on is simply insufficient to convey the remarkable simplicity and charm of her style of astronomy. She has become, and remains, one of my favourite astronomers in the whole wide world, and believe me, I know more than a few.

Hilton Ratcliffe
Hillcrest, KwaZulu-Natal, South Africa



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Andrew,
I will always look up at the stars,
smell the night and know that the distance between us will melt away

In so many respects just saying “thank you” would not be adequate to credit everyone who has motivated me and, above all, believed in me.

Stargazing won me over a long time ago, got into my bones, found a welcome place in my heart. It brings me great joy and I never tire of it. Being an active member of Astronomy South Africa, I feel the need to share the wonders of the starry skies with fellow members. It is important to give time to everything that is worthwhile in one’s life. This also goes for the exploration of the starry skies. I started walking this road with Auke Slotegraaf as my mentor and teacher many years ago to understand and observe the many facets of astronomy. I took Auke by surprise one day when I asked him whether I could have my own column in *Mnassa*. Without hesitating he cleared the way for me to tackle “*Astronomy Delights*” as a challenge, to give it character, and to make it a column to be proud of.

Now, 17 years down the line, and 88 constellations later, I look back on the exciting journey it has been – it has not only been a learning process, it has also brought me much fulfilment. Searching out deep sky objects and sketching them adds a wonderful, interesting world with some exception and unique characteristics, and in this book, I share all with a great sense of joy and delight. I hope and trust that my humble contribution dealing with the 88 constellations has helped reveal a world of many wonders in the infinite cosmos.

Magda

How to Observe the Starry Skies

Introduction

The development of new technology has slowly but surely also spilled over and progressed into the world of the amateur astronomer. However, let's also look at the night sky with its multitude of interesting objects that can be observed, discovered and appreciated through a telescope, binoculars and the naked eye. To locate the different deep sky objects discussed in this book I suggest detailed use of various star maps and electronic databases. Unless stated otherwise, north is on top and east to the left in all the sketches, illustrations and photographs. The best time to locate the constellations I describe is when they are located high up in the sky – that is also when the directions given are most applicable and easy to follow. It is very important to document and save your observations.

The main details you should record

1. An estimate magnitude of the visible starry sky.
2. Location, date and time relating to each object described.
3. Telescope particulars: size, type, focal length and eyepiece sizes.
4. Starfield size in arc-minutes, as well as field directions.
5. Various filters used, if any.

Tips for an observation session

1. Plan your observations and get to know the starry night skies.
2. Let your eyes become dark-adapted, avoid light pollution and the moon.
3. Provide enough time for a detailed observation when they are at their highest point in the sky.
4. Be patient and relaxed, seated comfortably, dress warmly and use a hat or beanie to keep your head warm.
5. Describe and sketch objects as you observe them.
6. Averted vision (direct your eye slightly away from the object) is sometimes the way to go for a positive observation.
7. Extra pencils, paper, batteries and insect repellent.
8. Keep something to eat and drink close at hand.

Brightness of the sky on a scale of 1 (excellent) to 8 (bad)

1. The most crystal-clear sky is visible.
2. The sky is clear.
3. Haziness is visible only on the horizon.
4. Mist with moisture in the sky, although faint stars are still visible.
5. Noticeably fleecy clouds appear.
6. General normal sight is hindered.
7. Moisture, smoke and clouds cause reflection.
8. General vision is reduced and observation impossible.

Darkness of the sky on a scale of 1 (pitch-dark) to 8 (light)

1. A dark Moon and magnitude 6 stars are visible with the naked eye.
2. The whole Milky Way is visible, but just at certain times of the year.
3. Reflection of the sky is of the same brightness as on a night with a three-day-old Moon.
4. Only the brightest parts of the Milky Way are visible.
5. The upper sky is still dark but the horizon is flooded with light.
6. The sky is lit up by the effect of light pollution.
7. Stars are scarcely visible.
8. The sky is overwhelmingly bright as if by a full Moon.

Telescope seeing on a scale of 1 (excellent) to 8 (lost)

1. The observable starfield is clear, with limited star flickering.
2. The atmosphere is stable, with little temporary turbulence.
3. Only fine detail might be lost.
4. Clarity and detail of the objects start to disappear.
5. Stars appear unstable and flicker badly.
6. At low magnification parts of the object are out of focus.
7. Brightness is unstable and objects alternate in and out of focus.
8. The atmosphere shows heat waves; totally unstable.

Open Clusters

As our skies become increasingly more polluted, we have to look at open star clusters in a different way. Boring it certainly is not, as the star groups all have different characteristics and form unbelievably beautiful compositions. Eight points are of great importance when observing and summarising open star clusters.

1. Clearly visible against the background starfield.
2. Shape and size: round, oval, rectangular, indicate direction.
3. Star magnitude: equal brightness, or a mixture of bright and fainter stars.
4. Star concentration: weak, relatively rich or extremely rich, as well as the density of the middle area.
5. Double or outstanding stars, star strings, what are the colour variations.
6. Visible open parts, as well as haze or dark areas inside the cluster.
7. Describe the star cluster and starfield.
8. Provide character and descriptions until a complete picture is created.

Globular Clusters

Some of the most beautiful and enriching objects in the sky are the globular clusters, which are tightly packed with thousands of stars on the outer fringes of our Milky Way. Globular clusters are challenging objects to study, but very exciting, and they can create an impression of being 3-dimensional. Eight points are of great importance when summarising and observing globular clusters.

1. General impression: hazy periphery, granular, visible star points.
2. Shape: round or oval.
3. Surface brightness.
4. Distribution of stars.
5. Density and brightness of the central core.
6. Resolution of stars.
7. Dark specks and lanes, star strings, as well as open spaces within the globular cluster.
8. Inexhaustible character can be established.

Planetary Nebulae

The most delicate objects in the sky surely are the planetary nebulae. Mysterious characteristics can be observed in these beautiful and intricate objects. Five points are important when describing a planetary nebula.

1. Shape: round, oval, bipolar in a variety of shapes.
2. Periphery: sharply edged or hazy.
3. Colour: smoke white, smoke grey, light blue or blue green.
4. Observable centre star: if there is one, note the magnitude.
5. Surface impression with or without the use of filters, centre detail and general appearance.

Galaxies

Take a moment to consider the immeasurable universe filled with a multitude of galaxies. Here the secret is to devote time and patience at the eyepiece to unravel these untold wonders. Consider the following six points when observing galaxies.

1. First impression, surface brightness.
2. Shape and size: round, elliptic or linear in appearance.
3. Nucleus: slightly brighter or overwhelmingly bright.
4. Prominent stars on the surface, possible supernova or satellite galaxies.
5. Appearance: spiral arms, dark lanes, knots or visibly uneven stains.
6. Complete a grading of brightness and magnitude, add character.

Nebulae

Nebulae are breathtaking objects which are rewarding to observe. Consider the following five points when observing nebulae.

1. Impression: clearly noticeable with contrast against the background in the field of view.
2. Shape: Impressions in many of ways.
3. Detail: strands, swirls, dark lanes and bright areas.
4. Grading the brightness and magnitude of the surface.
5. Appearance of the nebulae and overall character.

Guidelines for sketching deep sky objects:

1. Practise during the day before observing at night, with softer and harder strokes of the pencil on paper, and get used to the feeling of the eraser.
2. Use only a red light at night for sketching, reading and taking notes.
3. Break down the different parts of the object into steps to make sense of it.
4. Work outward from the core with faint pinpoint light specks created by a steady hand.
5. Finish off by wrapping a tissue around your finger and just lightly brushing over the whole object to give it a soft, nebulosity-glow where needed.
6. Use a grid under the paper if necessary.
7. Breathe through your nose to prevent condensation on a cold eyepiece.
8. Decision for final drawing: black on white or white on black.

A sketch allows you to look at the object for longer than just a glance, so don't just look and not see. Practise sharpening your eye. You will become increasingly observant as time goes on, and that will be very rewarding.

Join in the efforts against bad lighting that cause light pollution and help preserve our dark skies – for astronomy, for our children and for the beauty of the stars.

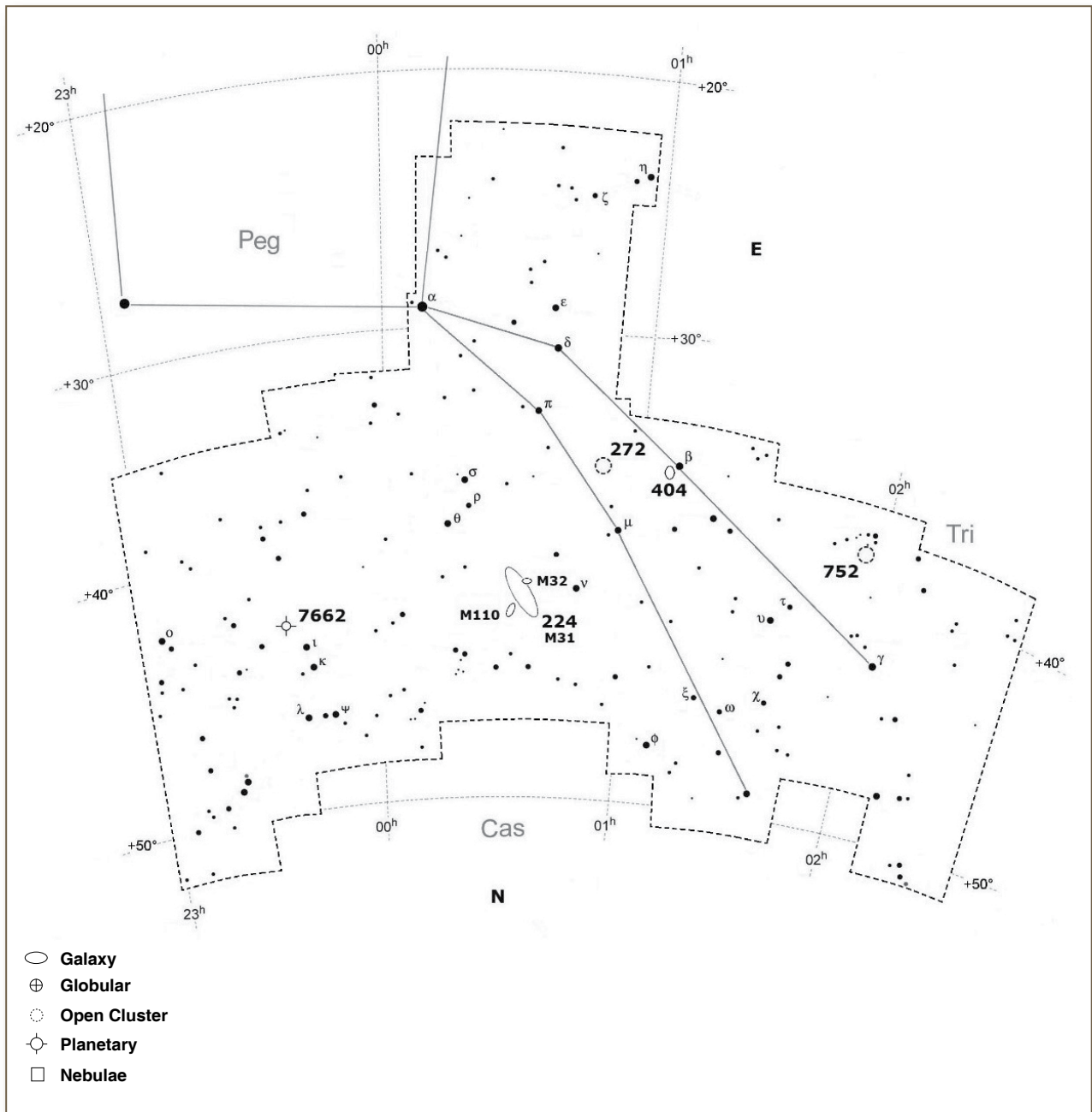
GREEK ALPHABET

A	α	Alpha
B	β	Beta
Γ	γ	Gamma
Δ	δ	Delta
E	ϵ	Epsilon
Z	ζ	Zeta
H	η	Eta
Θ	θ	Theta
I	ι	Iota
K	κ	Kappa
Λ	λ	Lambda
M	μ	Mu

N	ν	Nu
Ξ	ξ	Xi
O	\omicron	Omicron
Π	π	Pi
P	ρ	Rho
Σ	σ	Sigma
T	τ	Tau
Y	υ	Upsilon
Φ	ϕ	Phi
X	χ	Chi
Ψ	ψ	Psi
Ω	ω	Omega

KEY

- Arc-minutes – Indicated as – ′
- Arc-seconds – Indicated as – ″
- Carbon Stars – Giant stars in which carbon dominates over oxygen.
- Cepheid Stars – Fluctuating light of the normal star to be described a Cepheid variable star.
- Degrees – Indicated as – °
- Double Stars – Stars that have two or more components.
- DSH – Deep Sky Hunters Catalogue – Searching for Star Asterisms.
- Eclipsing Binary Stars – A double star in which the orbital plane is nearly or in the line of our sight.
- Emission Lines – Narrow bright emissions in the spectra of interstellar Clouds.
- ESO – European Southern Observatory.
- Filters – Oxygen (O-III), DSF (Deep Sky), UHC (Ultra High Contrast).
- Giant Stars – Luminous evolved stars whose cores have gone past hydrogen burning.
- GN – General Nebula Databank.
- GSC – Guide Star Catalogue.
- Guide – Electronic Star Data Base.
- HD – Henry Draper Catalogue.
- Hippacros – Input Catalogue.
- IC – Index Catalogue.
- Light-year – The distance light travel, 300,000 kilometres per second, total up into 1 earth-year.
- M – Messier Catalogue.
- Magnitude – A measure of the apparent or absolute brightness of a star.
- Mira star – Mira-type variable is a red giant star whose light changes by more than a magnitude.
- Neutron stars – The dense remains of an iron-core-collapse supernova.
- NGC – New General Catalogue.
- PA – Position Angle.
- PGC – Principal Galaxies Catalogue.
- RA and DEC (J2000.0) – Right Ascension and Declination.
- SAO – Smithsonian Astrophysical Observatory.
- S Stars – Red giant stars whose temperatures parallel those of M-type and N-type stars.
- T Stars – Coolest stars defined by methane absorption bands.
- Uranometria 2000.0 Catalogue.
- UGC – Uppsala General Catalogue of Galaxies.
- Wolf-Rayet Stars – Unusual pattern in the wavelengths of light emitted by certain stars.



The constellation of Andromeda

ANDROMEDA

A Sky Princess

According to ancient inscriptions Andromeda was the daughter of king Cepheus and Cassiopeia and was chained by her father between the heavenly stars for several reasons. The happy ending was that she was rescued by Perseus, who married her.



The Andromeda figure can be seen located northwards from the constellation of Pegasus, with the rectangle's north-eastern corner being the star alpha Andromedae. The image can be easily identified as it forms clear lines with reasonably bright stars, including the yellow-coloured magnitude 3.2 delta Andromedae and magnitude 2 beta Andromedae. The latter boasts a strong orange colour.

Form a triangle southward with beta and mu Andromedae to find an open star cluster standing out fairly clearly against the background starsfield. **NGC 272** displays an L-shaped group of stars in a north-western to south-eastern direction. Six of them vary in brightness, between magnitude 10 and 11, while the corner magnitude 9 star of the L-shape has a magnitude 13 companion, giving the impression of a double star. The grouping is more representative of a star string than a genuine star cluster as it is rather dubiously classified in various catalogues.

The lovely bright beta Andromedae has the galaxy **NGC 404** for company which can be found just 6' north-west of this beautiful star. But be aware of trying to observe both in one eyepiece field of view, as attempting it could be a challenge. The star brilliancy dims the appearance of the galaxy. No wonder it has been popularly called Mirach's Ghost. However, when one manages to spot this dwarf lenticular galaxy of Type-SO, it displays a round shape with a bright nucleus. A surprise was to spot the very faint star on the northern rim. But don't be scared of the ghost – it is a safe 10 million light-years distant – whereas beta Andromedae is only 200 light-years away from us.

A cluster which is not scared of ghosts and presents itself nice and clearly is the grouping **NGC 752** situated in the eastern part of the constellation 2 degrees from the border with Triangulum. The cluster displays bright scattered stars interspersed with fainter members, somewhat elongated in a north-eastern to south-western direction. The eastern part of the grouping is dominated with few brighter stars, and most prominent is the yellow-coloured magnitude 7 star towards the southern edge. The galaxy IC 179 is situated only a few arc-minutes away towards the north-east.



NGC 7662 – Photograph: Flickr

In the western part of the constellation the planetary nebula **NGC 7662** takes its place in galaxy world. Popularly known as the Blue Snowball Nebula it truly reflects a lovely light blue-greenish-coloured snowy oval ring with traces of a darker inner part. The distance to this nebula is not known with any real accuracy. Leland Copeland noted this nebula with the appearance of a light blue snowball in 1960, and it is therefore now also known as Copeland's Nebula.



NGC 224, M31 – M32 – M110 – Galaxies

Doing justice to beautiful women, Andromeda displays her prize object **NGC 224**, better known as Messier 31, or the Andromeda Galaxy, in its full glory. It is situated less than a degree west of magnitude 4.5 mu Andromedae. What is it about this galaxy that fascinates us so much? To start with it is bright and easy to observe! One does not have to search far to realize that there are millions of star cities out there similar to our own home galaxy. Because we cannot observe our galaxy from the outside, it is worth looking at galaxies very similar to ours. Among our local group of galaxies, which contain some 35 members, the largest is

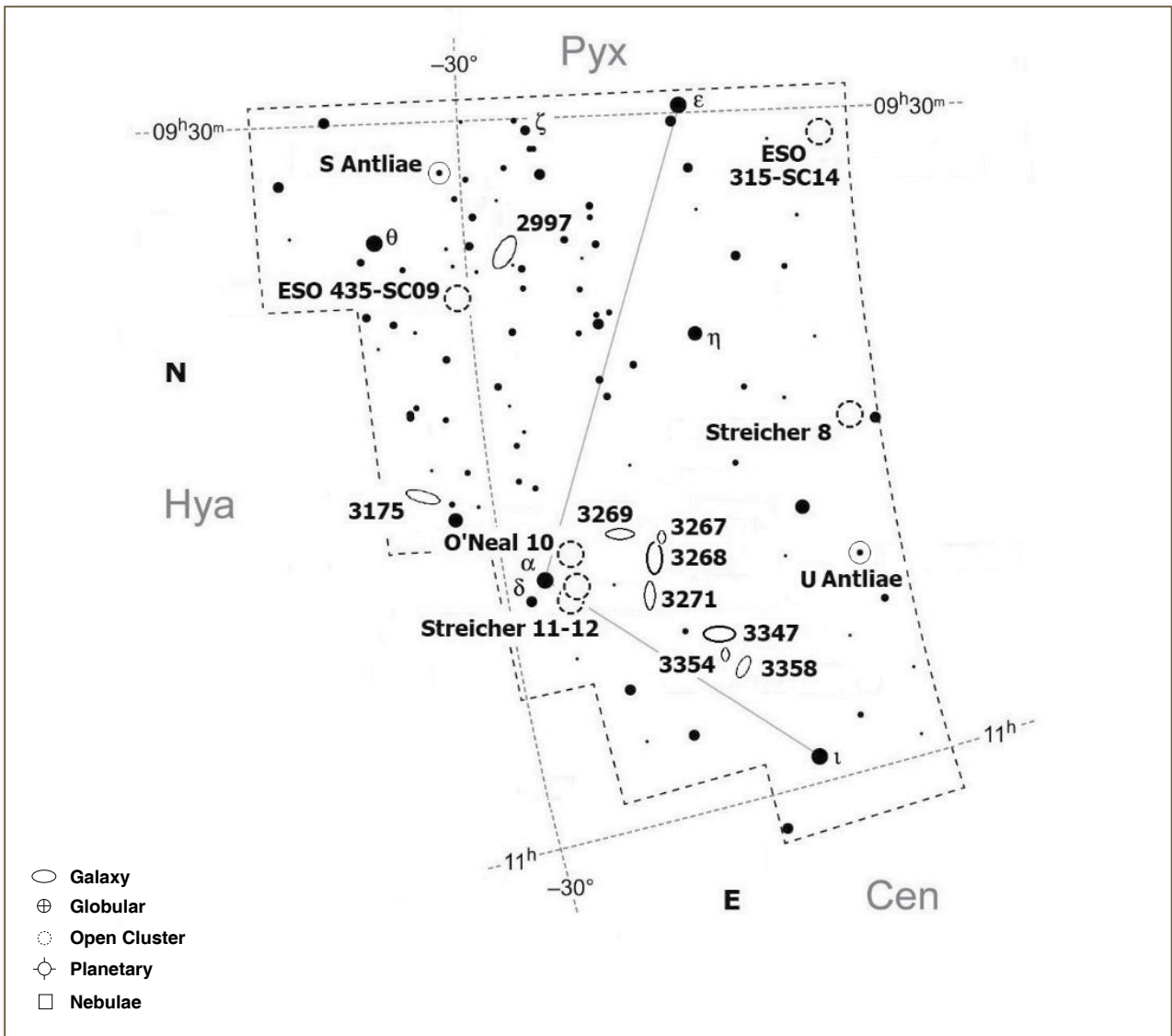
M31, which gives us a ringside seat. This amazing, large, abundant glow is situated 2.1 million light-years away from us; it is the remotest object visible to the naked eye. The nucleus appears smooth, dusty and bright, and displays a surface character to admire. Astronomers suspect that this distant island universe has had a violent past and contains many stars with heavy elements. It also contains some 300 billion suns and is spread across 130 000 light-years, rushing towards us at nearly 300 kilometres per second. Part of the family is M32, which displays a ball of an outstanding haze situated snugly close to the south-eastern outer rim, with M110 on the north-west edge. M31 has probably grown by swallowing up smaller galaxies, just like our own Milky Way shows signs now of cannibalism, but on a smaller scale.

In 1923 astronomer Edwin Hubble studied photographic plates of this great nebula in Andromeda. He was the first to resolve M31 into stars using the 100-inch Hooker telescope and, on the basis of the periods of Cepheid variables that he found, he calculated the first roughly correct distance and helped to prove that M31 was an exterior island, or galaxy.

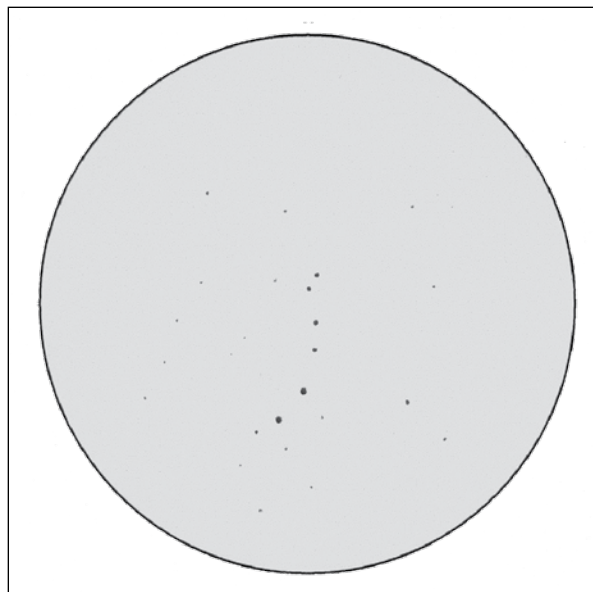
Cepheids take their name from the constellation Cepheus, where astronomers discovered the first example, delta Cephei, of this new class of variable stars. In 1908 Harvard College Observatory astronomer Henrietta Swan Leavitt first noted a relationship between the average brightness of Cepheids and the periods of their fluctuations. George Bond at Harvard was the first to clearly map spiral structure in M31, but he could not tell what they were. Isaac Roberts was the first to define the spiral arms clearly-detected in photographs he took in the late 1880s.

Don't be scared of nearby galaxies; rather go out to discover them and enjoy another wonderful evening under the stars.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 224 Messier 31	Galaxy	00h42m.7	+41°16'.6	3.4	185'x75'
NGC 272	Open Cluster	00h51m.4	+35°50'.0	8.5	5'
NGC 404	Galaxy	01h09m.4	+35°43'.4	10.3	6'x6'
NGC 752	Open Cluster	01h57m.9	+37°40'.9	5.7	50'
NGC 7662	Planetary Nebula	23h25m.9	+42°33'.0	9.2	12"



The constellation of Antlia



STREICHER 11 – Asterism

ANTLIA

The Machine Pneumatique

The apparently insignificant constellation Antlia lies just south of Hydra and borders Vela to the north, lying along the branches of the Milky Way. French astronomer and celestial cartographer Nicolas-Louis de Lacaille was responsible for creating some of the newer southern constellations when he visited the Cape of Good Hope from 1751 to 1752: Antlia (the Air Pump), Caelum (the Chisel), Circinus (the Drawing Compass), Fornax (the Furnace), Horologium (the Clock), Mensa (the Table, named after

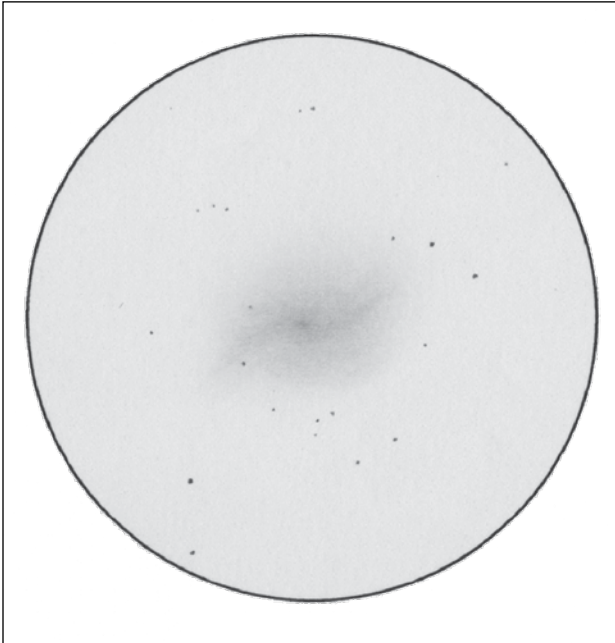
Table Mountain in South Africa), Microscopium (the Microscope), Norma (the Square), Octans (the Octant), Pictor (the Painter's Easel), Pyxis (the Mariner's Compass), Reticulum (the Net), Sculptor (the Sculptor), and Telescopium (the Telescope). The fifteenth constellation Quadrantid did not last, just like the geese, the cat and the typographic machine.



Antlia, the smallest of the de Lacaille constellations, was originally named by de Lacaille as the Machine Pneumatique, commemorating the air pump, which was invented by Robert Boyle. However, I just love the German name Luftpumpe. It is difficult to visualise a pump shape amongst the star formation with Antlia containing no stars brighter than magnitude 4.2. This southern treasure should, however, by no means be underestimated. To start with, it hosts a huge number of galaxies.

The long leg between alpha and epsilon Antliae spans nearly 13 degrees in a north-west direction. It appears as if this part represents the base of the pump with the shorter attached tripod stretching north-east from alpha to iota Antliae. The lever of the pump could be projected by the double star zeta Antliae, situated 4 degrees north of epsilon Antliae and virtually on the border with the constellation Pyxis. The double star zeta Antliae is a beautiful silvery white magnitude 6.2 star with a magnitude 7.1 companion. The separation is 8" and the position angle (PA) 212°. John Herschel measured the double star in 1836 and there has been no observable change since then. It was previously identified as a multiple star in the *Hipparcos Input Catalogue*.

A special star can be found 3.3 degrees north from zeta Antliae. S Antliae is an eclipsing binary of the EW Ursae Majoris type, a system of two dwarf stars in close orbit around each other. The star varies by half a magnitude from 6.4 to 6.9 over a period of only 7 hours - and could quite easily be followed during the course of an observation session. At the time of its discovery it was the variable star with the shortest known period. It was discovered by a man known only as Paul in 1888 (*Star Names: Their Lore and Meaning* – Richard Allen).



NGC 2997 – Galaxy

Notwithstanding the fact that galaxies are some of the faintest objects, observing them remains an unbelievable privilege. The beautiful galaxy **NGC 2997**, also known as Bennett 41b, is situated 4 degrees further south-east of S Antliae and is certainly outstanding in appearance. Although not very bright, this galaxy is seen as a north-west to south-east hazy oval. Higher magnification reveals that it gradually brightens towards a well-defined, but small nucleus. The eastern and western outer edges appear gaseous and bulge slightly, almost like drooping shoulders, with a hint of spiral structure towards the

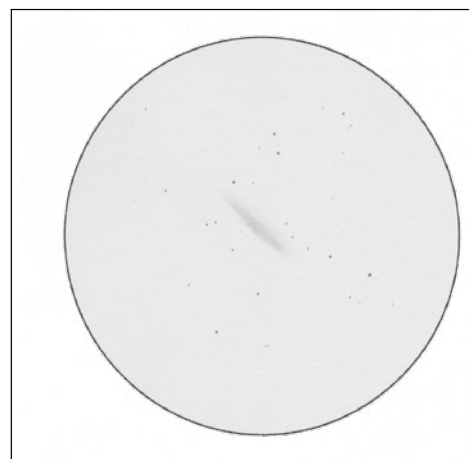
north-western tip of the galaxy. A few faint stars can be seen close to the south-eastern rim of this star city. NGC 2997 was discovered by William Herschel in 1793, when only 8 degrees above the horizon at Slough, England. He noted it as a nebulous atmosphere, extremely dilute and little brighter towards the middle. Other observers disagree about the appearance of the galaxy's nucleus. John Herschel records the nucleus as fairly distinct and round. Walter Scott Houston, the late American amateur, recorded it as a glow with little central condensation while Ernst Johannes Hartung notes it as having a well-defined, much brighter nucleus.

Professor Ernst Johannes Hartung (1893–1979) produced a comprehensive and highly respected guide for southern observers, titled *Astronomical objects for Southern Telescopes* in 1968. The guide was revised and expanded by David Malin and David Frew in 1995. Hartung was not a professional astronomer, but a lecturer in chemistry at the University of Melbourne, Australia and spent most of his life in and around Melbourne indulging in astronomy, which was his passion.

One of the few open clusters in Antlia, **ESO 435-SC09**, can be found if one draws an imaginary triangle east between NGC 2997 and the magnitude 4.7 theta Antliae. About a dozen faint stars are grouped together in an elongated north-west to south-east direction. It almost appears as two rows of stars running more or less parallel to each other in a slightly oval shape with even fainter stars to fill in the gaps.

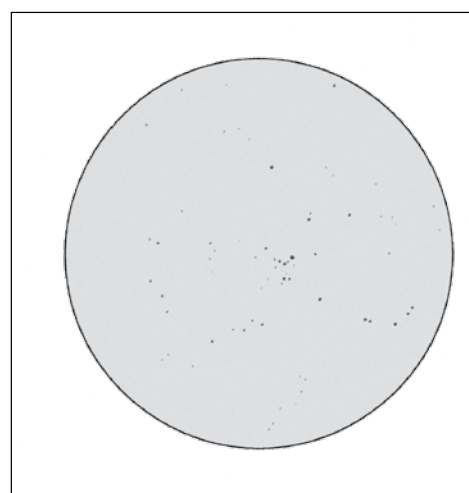
The Antlia Dwarf Galaxy is situated virtually on the border with the constellation Hydra. It is believed to be tidally interacting with the barred spiral NGC 3109. This dwarf galaxy was discovered by research students Alan Whiting and George Hau of Cambridge University in England while visually inspecting UK Schmidt Telescope photographic survey plates. The discovery was announced on 10 April 1997. Dwarf galaxies form the building blocks of larger galaxies.

NGC 3175, one of the most outstanding galaxies in appearance, is situated in the far north-eastern part of Antlia, 1.3 degrees from the constellation Hydra. The galaxy displays with pride an elongated beam of light in a north-east to south-west direction. Furthermore, it has an uneven surface brightness with a faint, barely seen nucleus. A short arc-shape of a few faint stars curls out from the galaxy's western side. This edge-on galaxy is approximately 50 million light-years distant.



NGC 3175 – Galaxy

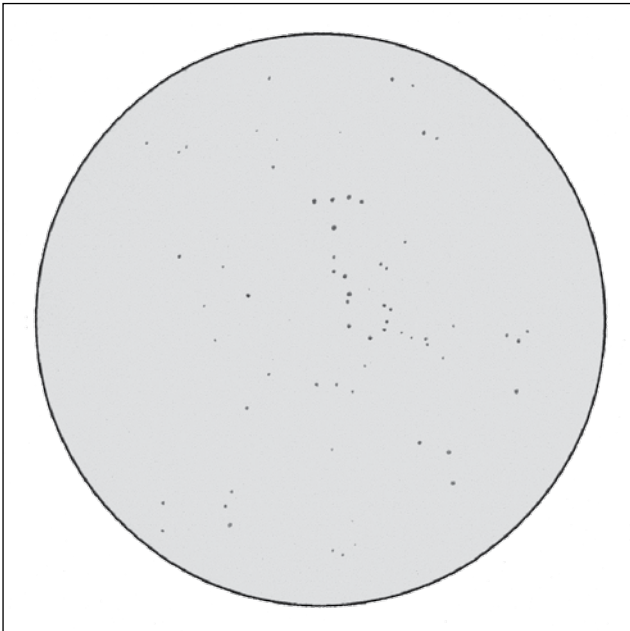
I discovered an asterism 2 degrees south-east of alpha Antliae. **STREICHER 12** is a small grouping, neither very bright nor very faint, but fairly visible against the background stars. It consists of two small groups with the larger towards the north and the smaller to the south. The stars vary between magnitudes 8 to 10.



STREICHER 12 – Asterism

STREICHER 11, a few arc-minutes further north displays a long string in a north-east to south-west direction, consisting of seven stars with the brightest member magnitude 8 towards the south-west.

The star alpha Antliae is an easy star to spot with the naked eye in the north-east of the constellation. It displays a lovely warm orange colour of spectral Type-K4. The star shines with luminosity some 500 times greater than our sun and it is estimated to be 350 light-years distant. This beautiful magnitude 4.2 star signals the portals to the many galaxies situated mainly to the south within the constellation.



O'NEAL 10 – Asterism

Michael O'Neal came across an asterism in this galaxy-strewn area 2 degrees south-west of alpha Antliae. It is exciting when asterisms are found in many forms that represent images of sorts. It would be difficult to find anything closer to a mini Scorpius constellation than when one looks at the shape of the grouping **O'NEAL 10**. Although a little lopsided, the grouping consists of around a dozen stars with the imaginary starry head pointing north. A lovely magnitude 8.7 star, HD 89949, situated in the northern part of the asterism resembles the famous star Antares. The main body

of the asterism runs from north to south. The galaxy NGC 3241 is situated just 25' to the east of this grouping.

Moving into the real deep world of galaxies, ABELL S0636, also known as the Antlia Galaxy Cluster, is situated in the south-eastern part of the constellation. Abell S0636, which contains about 234 galaxies, is dominated by the two massive elliptical galaxies, NGC 3268 and NGC 3258, with the northern subgroup gravitating around the former and southern subgroup around the latter. This group of galaxies is also part of the Hydra-Centaurus Galaxy Cluster, the third nearest to our Local Group of galaxies.

The main focus of the galaxy group Abell S0636, however, weaves around **NGC 3268**, by far the largest and brightest galaxy in this field. The round to oval glow of NGC 3268 is easily seen rising evenly to a slightly brighter nucleus. What held my eye was the very hazy envelope around the edge of the galaxy. Hanging onto the western tip of NGC 3268 is a smaller dust speck indicating the companion galaxy **NGC 3267**, surprisingly quite easily seen with higher magnification. A pair of faint stars separates these two galaxies.

NGC 3269 is situated 6' north of NGC 3268, slightly elongated in a north-south direction. Outstanding is the fact that NGC 3269 consists of a nice bright nucleus. **NGC 3271**, another galaxy member, situated 5.5' south-east of NGC 3268, displays an elongated oval in an east-west direction. This group of galaxies fits quite easily into as little as a 12' field of view.

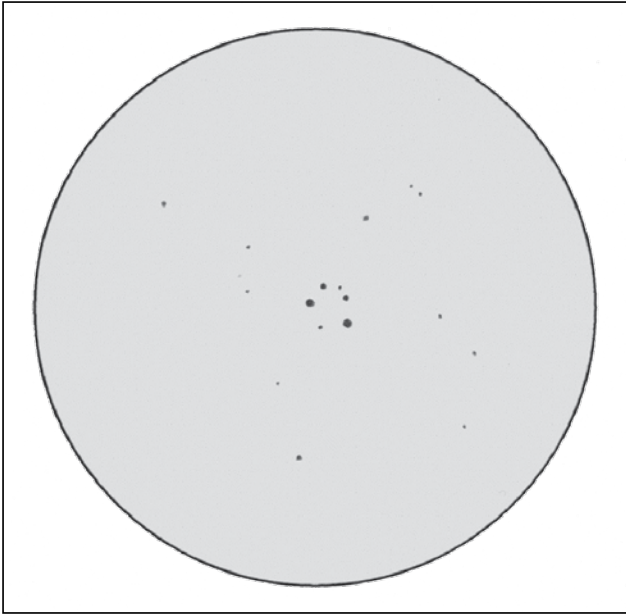
Situated 3.8 degrees north-west of iota Antliae, and also part of the Antlia group of galaxies is **NGC 3347**, towards the northern brink of a galaxy trio. NGC 3347 is slimmer in appearance to **NGC 3358**, situated at the south-eastern end. These two galaxies display hazy ovals, fairly brighter towards the middle. NGC 3347 is elongated in a north-south direction, and NGC 3358 in a north-west to south-east direction. Brian Skiff picks up a bright spot in the northern arm section of NGC 3358 which turn out to be a magnitude 14 star. The smallest of the three galaxies, **NGC 3354**, occupies the middle seat between the above mentioned two galaxies and appears as a very small out-of-focus spot. Again, the trio can be spotted in a 12' field of view. If you feel like hunting down galaxies of all sorts, this is definitely the area in which to spend some time. What amazes me every time I lay eyes on a galaxy, is the unbelievable fact that I am looking back millions of years into the past, making me realise the unfathomable vastness of space.



NGC 3271 – Photograph: In-The-Sky.org



NGC 3358, 3354 and NGC 3347
Photograph: Dale Liebenburg



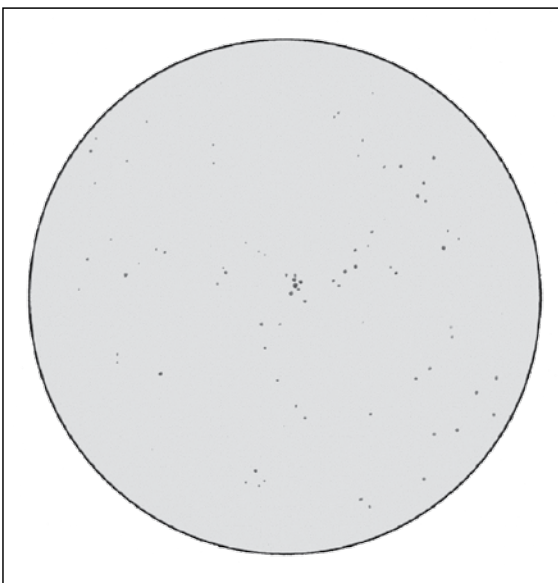
STREICHER 8 – Asterism

The asterism **STREICHER 8** really appeals to me and is a great pleasure to share with you. The asterism exercises a firm grip on the southern edge of the border with the constellation Vela. Standing out against the background starfield, this grouping consists of only a handful of stars in a half-moon shape with a difference. It reminds me of a set of headphones with brighter stars at the north-eastern and south-western ends. Fainter stars connect the shape to strengthen the impression.

Asterisms are decidedly among the most exciting star groupings for launching a celestial search, either through the telescope or use a star program, followed by a telescope observation. The Deep Sky Hunters forum is mostly amateurs hunting for unknown star groups and will be credited in the *Deep Sky Hunters Catalogue* if the forum is satisfied with the indicated criteria.

Take a moment to glance at U Antliae, situated 50' north of the constellation Vela along the southern Antlia border. This variable star displays a lovely warm rusty colour and changes magnitude from 8.1 to 9.7 in 302 days.

A further 2 degrees west of U Antliae along the southern border NGC 3244 can be found, part of yet another tight group of galaxies. NGC 3244 is the north-west member of nine NGC galaxies in a degree star field continuing southward.



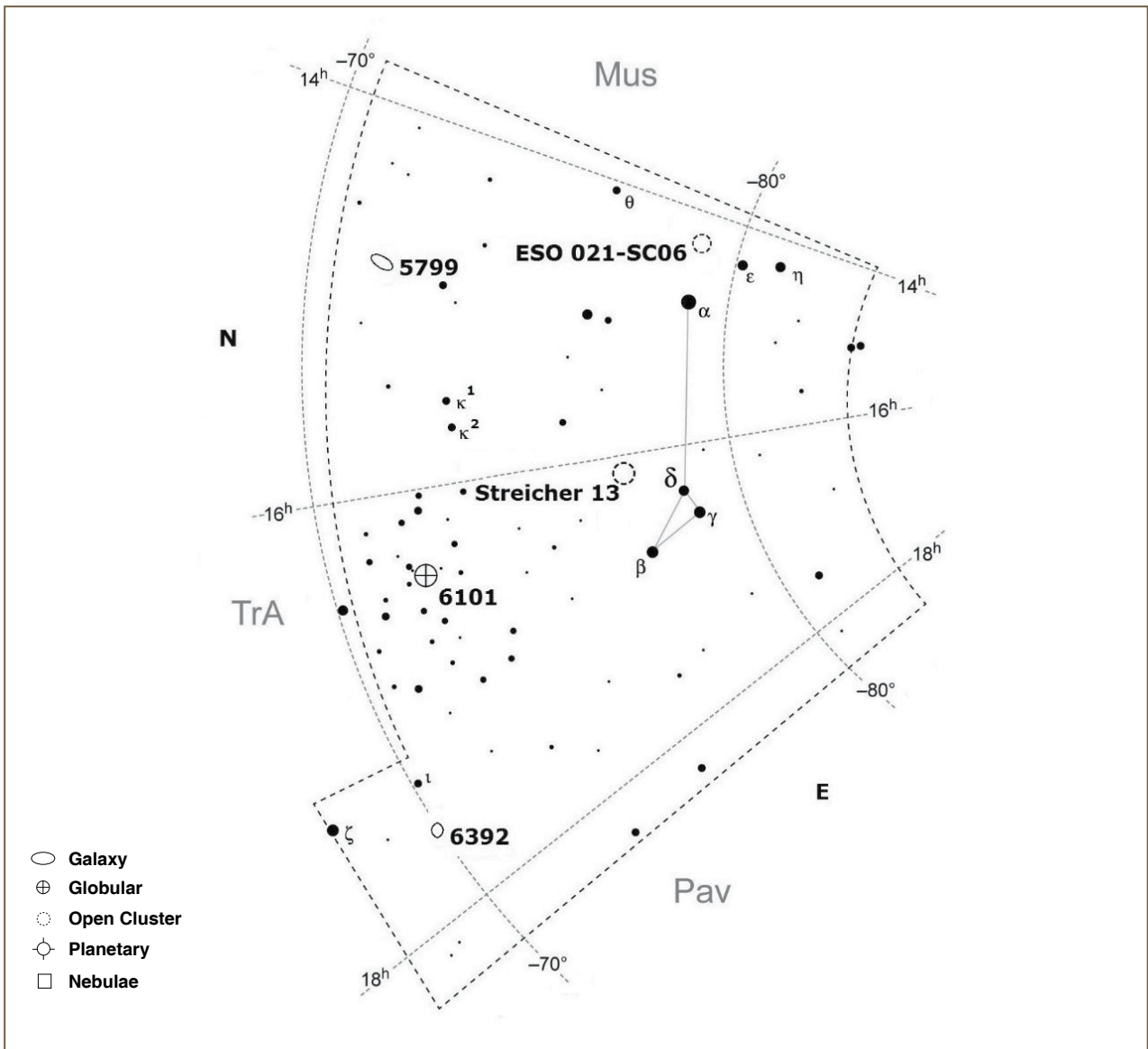
ESO 315-SC14 – Open Cluster

Right in the westerly corner of Antlia and just 1.5 degrees from the constellation Vela, the cluster **ESO 315-SC14** displays a beautiful compact knot of faint stars. Just pretty! I like this one. The group consists of a few faint stars grouped together in a tight configuration. The star towards the middle area, with a slightly yellow colour, is magnitude 10, which is also the brightest in the group.

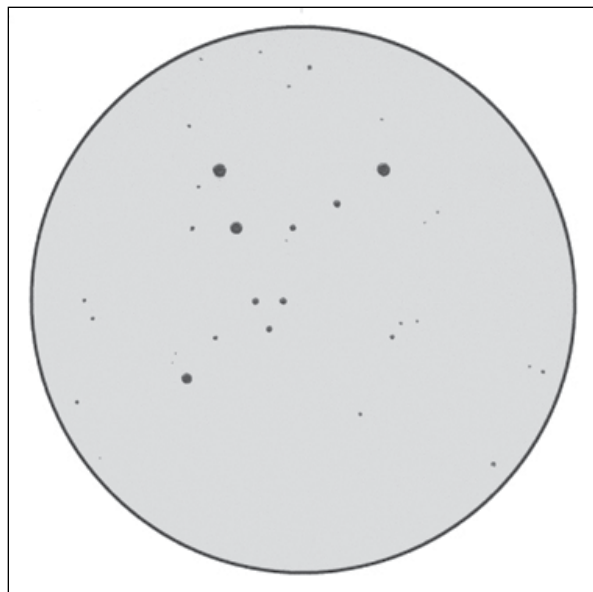
The 88 constellations made the cut in 1930 when they were listed by the International Astronomical Union and their boundaries were officially laid out by Belgian astronomer Eugène Joseph Delporte.

Whatever the shape of this scientific starry pump, allow it to breathe new motivation into your observations when next you compile a deep-sky "to-do" list.

OBJECT	TYPE	RA	DEC	MAG	SIZE
ESO 315- SC14	Open Cluster	09h35m.4	-39°32'.0	10	3'
NGC 2997	Galaxy	09h45m.6	-31°11'.2	9.3	10'×6.3'
ESO 435- SC09	Open Cluster	09h55m.5	-28°59'.0	9	15'
STREICHER 8 DSH J1013.8-4019	Asterism	10h13m.8	-40°19'.8	9	3.1'
NGC 3175	Galaxy	10h14m.7	-28°52'.3	11.3	5'×1.3'
O'NEAL 10	Asterism	10h21m.5	-32°44'.0	10	11'
NGC 3267	Galaxy	10h29m.8	-35°19'.4	12.5	1.9'×0.9'
NGC 3268	Galaxy	10h30m.0	-35°19'.5	11.6	3.2'×2.4'
NGC 3269	Galaxy	10h30m.1	-35°13'.5	12.2	2.5'×1.1'
NGC 3271	Galaxy	10h30m.5	-35°21'.6	11.7	2.8'×1.5'
STREICHER 11 DSH J1024.0-3128	Asterism	10h24m.3	-31°28'.8	10	12'
STREICHER 12 DSH J1031.7-3306	Asterism	10h31m.7	-33°06'.7	11.4	5.5'
NGC 3347	Galaxy	10h42m.8	-36°21'.2	11.4	3.7'×1.9'
NGC 3354	Galaxy	10h43m.1	-36°21'.8	13	0.9'×0.8'
NGC 3358	Galaxy	10h43m.6	-36°24'.7	11.5	3.8'×1.7'



The constellation of Apus



STREICHER 13 – Asterism

APUS

The Swallow

Apus, the bird of paradise or Apous as Caesius wrote it from the Greek, lies immediately below the Southern Triangle constellation just 1.3 degrees from the South Pole.



The grouping **ESO 021-SC06** is clearly visible against the background star field in a typical southern-cross shape, situated in the western part of the constellation. The cluster is elongated in an east-west direction, with the bulk of the fainter members to the south. The brightest magnitude 9.8 star is situated towards the northern edge.

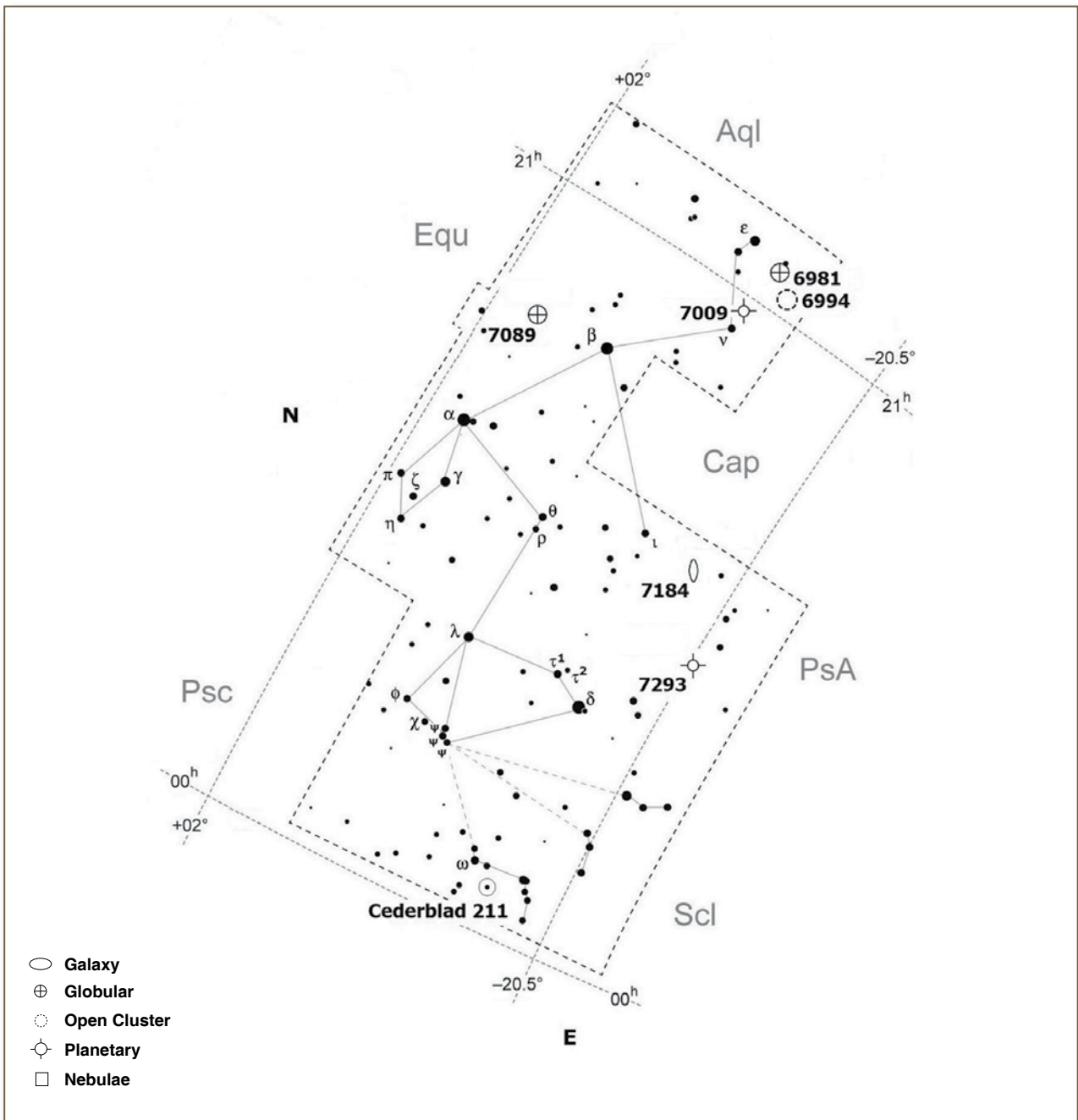
NGC 5799 is a relatively medium sized galaxy combined in a framework of faint stars which shows an arrow figure pointing south. The galaxy displays a hazy glow, slightly brighter towards the nucleus.

The asterism **STREICHER 13** displays a dozen stars of various magnitudes create the shape of an arrow. This grouping fairly stands out against the background star field situated 1.5 degrees north of delta Apodis.

Globular cluster **NGC 6101** situated towards the northern brink of the constellation displays a relatively large, round haze of light that reveals a granular appearance. With higher magnification faint stars could be seen curling out in flimsy flares towards the edges. It gets more condensed towards the middle area with a few brighter stars on the northern edge. Within the heart of this object, two brighter stars appear to be double.

The oval shaped galaxy **NGC 6392** situated in the north-eastern corner of Apus is a considerably faint object barely seen and just slightly brighter towards the nucleus. A faint star can be seen on the south-western edge.

OBJECT	TYPE	RA	DEC	MAG	SIZE
ESO 021-SC06	Open Cluster	14h15m.9	-78°30'.0	9.2	9'
NGC 5799	Galaxy	15h05m.5	-72°26'.2	12.6	1.2'×1'
STREICHER 13 DSH J1607.4-7720	Asterism	16h07m.4	-77°20'.0	9.8	18'
NGC 6101	Globular Cluster	16h25m.8	-72°12'.1	9.2	10.7
NGC 6392	Galaxy	17h43m.5	-69°47'.1	12.3	1.3'×1.3'



The constellation of Aquarius

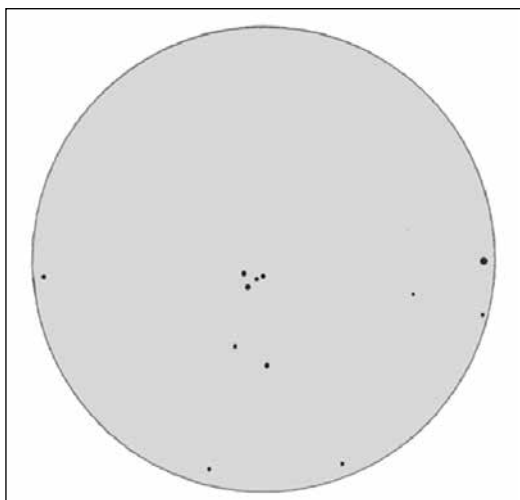
AQUARIUS

The Watering-Can Man

Aquarius is by no means just another constellation – it's quite simply something exceptional in its own right. Aquarius the Water Bearer spreads out its lanky image just north of the constellation Capricornus the Sea Goat. Other well-known water constellations are Piscis Austrinus the Southern Fish, Cetus the Whale, Delphinus the Dolphin and Hydra the Water Snake. Aquarius the Water Bearer was so named due to the Sun's entry into the constellation during the Babylonian monsoon season. The image portrays a man pouring water from a pitcher he's holding in his hand. Sprays of brighter stars in the north-eastern part of the constellation look like numerous drops of water and stand out well against the star field. When the constellation is about to appear in the east, magnitude 3.7, epsilon Aquarii pops up first as its western-most star.

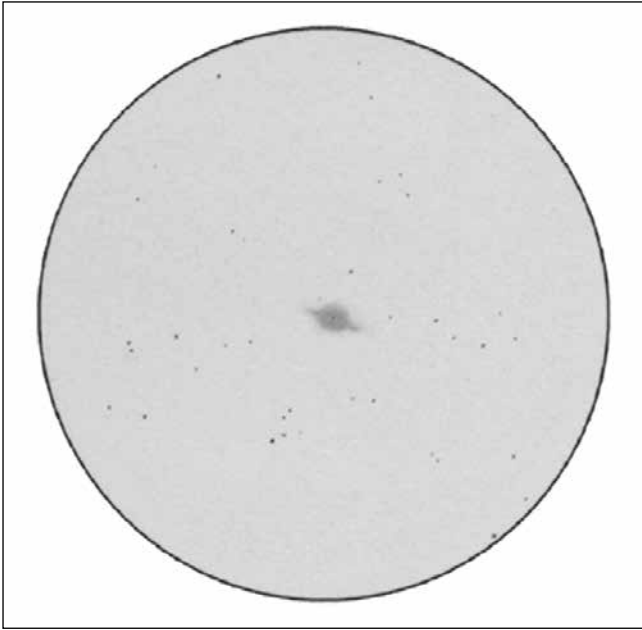


NGC 6981, also known as Messier 72, is situated approximately 3 degrees south-east of epsilon Aquarii. It is one of the faintest Messier globular clusters and may be as far as 53 000 light-years away. Pierre Méchain, the young rival of the French astronomer Charles Messier, discovered this object on the night of 30 August 1780. Averted vision yields the best view, which shows the object brightening relatively quickly to a core that appears slightly squarer than round and less concentrated than most globular clusters. It is not easy at all to resolve, although I can pick up a grainy tangerine skin impression, which makes me suspect partial resolution.



NGC 6994 – M73 – Open Cluster

Just 1.2 degrees further east, arguably one of the most interesting documented clusters can be found. **NGC 6994**, better known as Messier 73, consists of a group of only four stars, which the researchers at the University of Padua in Italy places at different distances to field stars. The magnitude 10.3 star is the southern-most and brightest member, and together they form a clear Y-shape. These four stars never cease to amaze me because of their sheer beauty.



NGC 7009 – Planetary Nebula

The planetary nebula **NGC 7009**, situated 1.8 degrees north-east of M73, was discovered by William Herschel on 7 September 1782. He used his 6.2-inch reflector with which the planet Uranus was discovered. Also known as the Saturn Nebula, it reminds of an alien ship approaching us like a whisper in the dark of night. My notes on several occasions indicate this object as one of the most breath-taking, bathed in a blue hue that deepens to a soft turquoise.

It is easily seen, relatively large and increasing in brightness towards its centre, with the magnitude 12.7 central star visible only with high magnification. The spreading out of the two thin prominent extended rays on the north-eastern and south-western sides probably indicates a ring being viewed edge-on. The south-western tip seems slightly brighter and longer.

It was named the Saturn Nebula by Lord Rosse in 1849, when the extensions projecting as ansae, reminded him of the planet Saturn. According to Stephen James O'Meara, the inner nebula contains two rings of material, probably related to different episodes of mass ejection. This may be due to the central star's rotational axis, that wobbles more or less every 30 000 years.



Adam Block is a world-renowned photographer with a high standard of quality deep sky photographs and was willing provide me with some of his excellent work, like this close up image of Planetary Nebula NGC 7009.

Globular clusters are very special objects, and one outstanding example is **NGC 7089**, also known as Messier 2. NGC 7089 forms a triangle towards the north-west with magnitude 2.9 alpha Aquarii (Sadalmelik), and magnitude 2.8 beta Aquarii (Sadalsuud). The globular is only just visible with the naked eye under truly dark skies. NGC 7089 displays a large round swarm of thousands of flickering lights, working up to a broad, dense core covered in a subtle envelope. With higher magnification the cluster appears to explode into faint stars, and when observed with care, even dark lanes can be discerned. My attention was held by a small, roundish, dark patch in the outer halo on the south-eastern edge, which extends slightly further south, where it nestles between faint stars. This outstanding object is almost 13 billion years old.



NGC 7089 – M2 – Globular Cluster
Photograph: Wikipediya

At first sight, the constellation appears to be static and unchanging. According to Tim Cooper, "year after year there is no apparent change in this constellation's appearance; indeed, the water man looks the same now as it looked to our grandparents many years ago. Yet at least twice a year the constellation of Aquarius literally comes alive with activity as meteors burst from its boundaries. It's almost as though the water literally spills and splashes. Aquarius is home to two major meteor showers, emanating from different comets, mirrored in the differing characters of the resulting meteors". The Aquarid complex of late July and early August comprises the delta and iota Aquarids, both of which are split into northern and southern branches and are probably remnants of comet 96P/Machholz".



Tim Cooper is well known in the study of comets and meteors in South Africa and abroad. He is an active observer, his knowledge in this field outstanding and also involved in advanced participation with papers and manuscript contributions to world-wide forums.

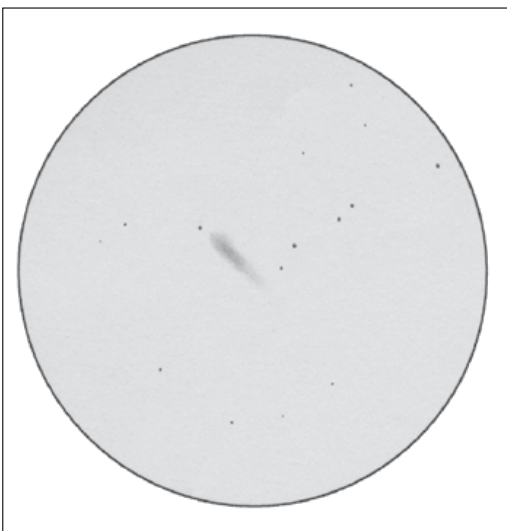
He proceeds to say: "The eta Aquarids peak in early May every year and are fast yellow meteors (entering Earth's atmosphere at 66 kilometres per second), with the brighter members often leaving persistent trains. The eta Aquarids are the remnants of comet 1P/Halley, named after Edmond Halley, who predicted that the comet of 1531 would return to perihelion in the year 1759".



Edmond Halley Plaque in Westminster Abbey, England

It is interesting to know that as a young astronomer Halley sailed in 1676 to the island of St Helena off the west coast of Africa to observe the southern stars.

The star zeta Aquarii is a lovely double star and is situated in the verna or water jar, towards the northern part of the constellation. The primary shines at magnitude 4.3 and the companion a tad less at magnitude 4.5, separated by only 2.2" at a position angle (PA) of 168°, with a rotation period of nearly 487 years. One can follow the sprinkled water droplet stars that flow down from zeta and eta Aquarii all the way to phi, chi and psi Aquarii right into the mouth of the Southern Fish named Piscis Austrinus.



NGC 7184 - Galaxy

Aquarius is home to a number of galaxies, most of which are fairly faint. **NGC 7184** is perhaps the easiest to observe situated 7 degrees south of iota Aquarii. It was William Herschel's first galaxy (H II.1), found on 28 October 1783, two days before he started regular sweeping with his 20-inch telescope. The galaxy is easy to see in moderate-sized telescopes; with higher magnification however, it shows off its almost edge-on shape with a suggestion of a concentrated brightness towards the small nucleus. It's a lovely galaxy with the south-western end thinner than the slightly rounder north-eastern end. What first

caught my attention was a string of four faint stars swinging out from the south-western tip of the galaxy, reminding me of a golf putter with the galaxy the head and the stars the shaft of the putter – a good example of where the stars in the field add to a unique impression.

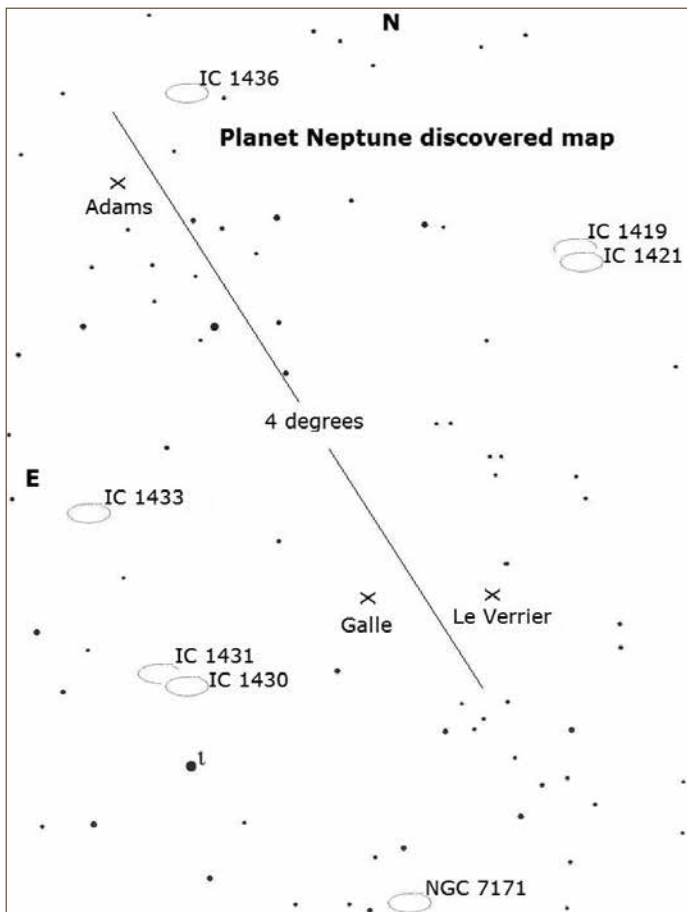
The constellation is home to a Mira-type star just a degree south-east of omega Aquarii in the eastern part of the constellation. R Aquarii varies with a 386-day period between magnitude 5.8 and 12.4, and shines with a dull orange colour. This binary system contains a white dwarf star, receiving material from the red giant Type-M5-8 star. Variability was first noted in the early 19th century by the German astronomer Karl Ludwig Harding who also discovered asteroid (3) Juno on 1 September 1804. **CEDERBLAD 211**, an extremely faint nebula, surrounds the star R Aquarii. Yann Pothier noted in his observation that it is a small nebula, extremely faint but with rather sharp edges, visible only at high magnification with an oxygen (O-III) filter. Two faint nebular streaks extend to the south-west and another brighter extension curves north-east towards a stellar knot. Deep images show an inner shell.

Our grand finale could be nothing else but **NGC 7293**, also known as the Helix planetary nebula situated in the southern part of Aquarius. At a distance of 450 light-years, it is one of the closest planetary nebulae to us. NGC 7293 was the first nebula found after the William Herschel era by a non-family member, Karl Ludwig Harding in September 1823. John Herschel had made his first discovery, NGC 7010, a galaxy in Aquarius.

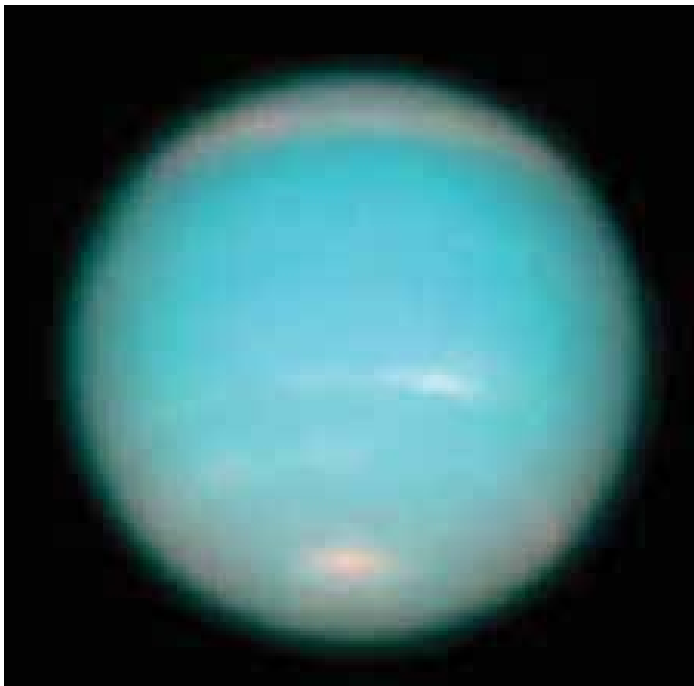


NGC 7293 – Planetary Nebula
Photograph: Adam Block

I can only try to bring this wonderful object to your mind's eye – NGC 7293 is extremely large, appears as a very faint, ghostly glow in a roundish annular ring shape, best seen using low magnification. With careful observation the light fades towards the middle area, becoming slightly darker. With higher magnification, the very hot, white central magnitude 13 dwarf star and a few other faint stars become evident on the dusty surface. The north-eastern and south-western peripheries of the nebula are relatively well defined and slightly brighter, with an outstanding double star rounding off the south-eastern edge. A nebular filter and dark skies are your best tools to admire this elusive nebula. The double-ring nebula is nicely described by Sue French, who sees it as looking down at two spring coils. A faint small magnitude 16 galaxy is situated very close and just to the south of a magnitude 9 star in the western extremity of the nebula.



the constellation Aquarius on 23 September 1846, less than a degree from the position Le Verrier indicated.



Planet Neptune – Photograph: HST – Ted Stryk

Aquarius also holds a piece of history. Jean-Joseph Le Verrier, was a junior astronomer of the Paris Observatory when he presented a paper that an undiscovered planet occupied the next place in the sequence and predicted the position of planet Neptune. He studied at the École in Paris from 1831 to 1835. Le Verrier was born at Saint-Lô in Normandy on 11 March 1811 and died in Paris, France, on 23 September 1877 (Michael Hoskin).

John C Adams a young mathematician also predicted the existence of a new planet. Johann Gottfried Galle of Berlin Observatory actually discovered and confirmed such a planet in

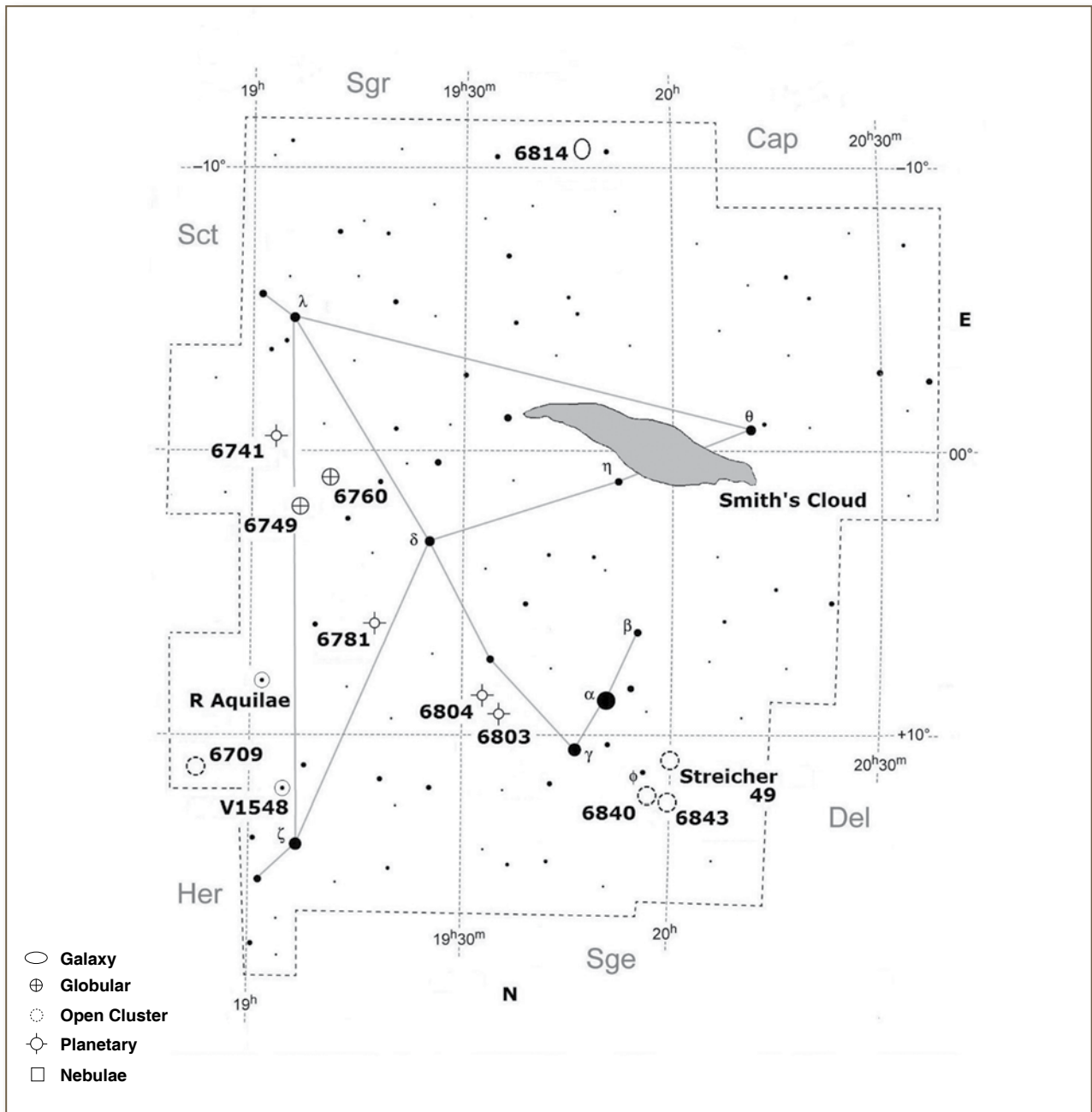
On 28 December 1612 and 2 January 1613 Galileo Galilei was observing Jupiter and logged a background “star” which was actually the planet Neptune. He did not realise that he was seeing a new planet. In 1845 and 1846 Johann V. Lamont at Munich Observatory had accidentally seen Neptune too in one of his observation sweeps. Neptune completes one full orbit around the Sun in 166 years, occupying the same part of sky in November 2011.

As the Watering-Can Man gladly shares his watery secrets, make use of this opportunity to flow with this deep-sky stream.



Jean-Joseph Le Verrier – Pencil Sketch:
Kathryn van Schalkwyk

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6981 Messier 72	Globular Cluster	20h53m.5	-12°32'.2	9.3	5.9'
NGC 6994 Messier 73	Open Cluster	20h59m.0	-12°38'.0	8.9	2.8'
NGC 7009	Planetary Nebula	21h04m.2	-11°21'.8	8.3	25"
NGC 7089 Messier 2	Globular Cluster	21h33m.5	-00°49'.2	6.4	12.9'
NGC 7184	Galaxy	22h02m.7	-20°48'.8	11.2	5.9'×1.3'
NGC 7293	Planetary Nebula	22h29m.6	-20°49'.2	7.3	769"
CEDERBLAD 211	Variable star and Nebula	23h43m.8	-15°17'.0	12.4	0.071"



The constellation of Aquila

AQUILA

A Tiny Bat versus the Mighty Eagle

In the wee hours before sunrise the Bushveld is a lot more intense, and so palpably different – I’m somehow reminded of Simon & Garfunkel’s “Hello darkness my old friend ...” from their melodious “Sounds of Silence”. The central part of the Milky Way hub enfolds against a truly dark night, however, I’ve seldom seen the Milky Way quite as graceful with a temporary difference at the time, because planet Jupiter was gracing the hub cake, like a cherry that lends a completely new dimension.



The Aquila constellation is supposed to represent a bird known on the Euphratean stones (1200 B.C.) as the eagle of the living eye. According to legend Hercules shot an arrow (Sagitta) at the eagle (Aquila), for stealing fire from the gods.

The shape of Aquila appears a lot more like a bat to me, if look at the overall view of the V-shaped constellation. It’s two outstretched wings are spread from delta to zeta in the north-west and theta Aquilae to the south-east. Bats regularly fly furiously around me at night to purify the air of the tiny noise-mongers called mosquitoes. What is not very well known is that bats are attracted by body heat in order for them to find their food. But don’t believe the old wives’ tale that they’ll get all entangled in your hair. I’ve come to regard them as my friends and to accept them when they freely fly around me at night.

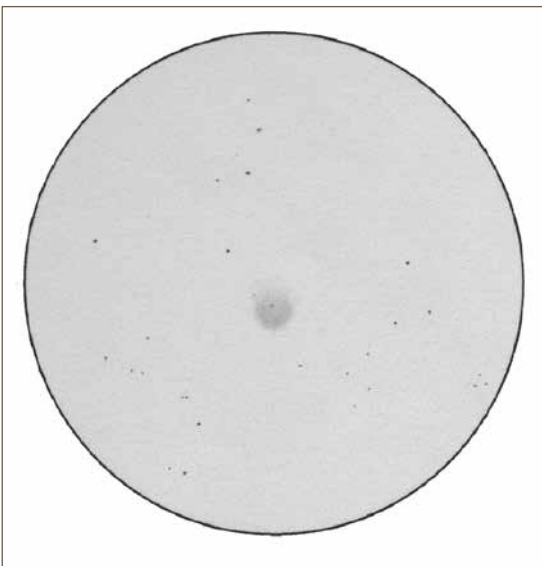
The beautiful magnitude one-star alpha Aquilae, known as Altair, is 16.7 light-years away, which plays the starring role in the Aquila constellation. It compels me to take notice and lures me into giving this northern constellation, hanging in the membranes of the Milky Way, a chance. The star Altair rotates rapidly, completing one revolution every 9 hours. The spinning causes the star to bulge up to about 20 percent wider along its equator than around its poles. Altair is among the brightest stars and also number 53 on the list of the closest stars.



NGC 6803 (top) – NGC 6804 (bottom left)
Planetary Nebulae – Photograph: CloudyNights

Approximately 3.6 degrees to the west, forming an imaginary triangle between alpha Aquilae and magnitude 2.7 orange coloured gamma Aquilae, are two planetary nebulae situated only a degree apart. **NGC 6803** the more northerly, is a relatively small glow but is seen quite well. It appears star-like but with higher magnification it becomes a round glow with a bright core.

Also, rather faint, but easier to see, is **NGC 6804**, just 50' towards the south. It displays a hazy oval shape and is well edged. With higher magnification the south-western side looks brighter, with the north-eastern edge that slightly fades away. A few faint stars can be spotted at the north-west edge. Averted vision and an oxygen (O-III) filter improves the view of this object to a beautiful blueish glow.



NGC 6781 – Planetary Nebula

Aquila hosts a "graveyard of planetary nebulae", to use the words of David Eicher. An outstanding planetary nebula is **NGC 6781**, which Lord Rosse saw as a "spiral". It is situated further south along the north-western wing of the starry bird. A nebular filter makes it a perfect globe of frosted light. With higher magnification the object displays a relatively bright semi-oval against the background star field. It displays a much brighter southern edge with a noticeably fading northern part and a slightly darker inner middle. The faint off-centre magnitude 14 star is north of centre, but is not the one that sets the nebula

alight. Auke Slotegraaf indicated to me that the central star responsible for the nebula's brightness is around magnitude 16. NGC 6781 was noted by William Herschel in 1788, who saw it only as a dim object. Hartung noted that the whole surface was very bright but, strangely, he made no mention of any stars on the object's surface.

I learned about the nova **V1548** Aquilae, which is situated barely a degree north-east of the cluster NGC 6738. This very special star is in sharp contrast against the starry field, with an out-of-focus feeling to it when I observed it in 2003. This exploding nova was first detected by an amateur during April 2000 and has since been observed regularly by a team led by researchers from the Arizona State University.

A further degree south the cluster **NGC 6709** shows up. The group is around 4000 light-years distant and displays a lovely stringy impression. Faint stars tear along like falling raindrops running in a north-western to south-eastern direction. A notable magnitude 9 golden coloured star can be seen in the middle part of the eastern string.



NGC 6709 – Open Cluster
Photograph: Wikipedia

The periodic variable star R Aquilae is also taking comfort under the north-western wing of the starry bird. The star varies between magnitude 5.5 and 12 in around 284 days and is about 170 light-years distant. Astronomers designate the first variable star discovered in a constellation with the letter R. When I observed this star in July 2007 it was bathed in an orange to red colour and I estimated the brightness then at around magnitude 11.

The magnitude 3.3 delta Aquilae, the wishbone star in the eagle's chest, points the way towards two globular clusters about 4.5 degrees west. The northern object, **NGC 6749**, is not very bright and only visible as a hazy glow, slightly brighter towards the centre. The faint stars of the open cluster Berkeley 42 can be seen towards the south-western edge of the globular cluster. The Berkeley Catalogue of 104 objects was published in 1960. The campus of the University of California was named after George Berkeley.

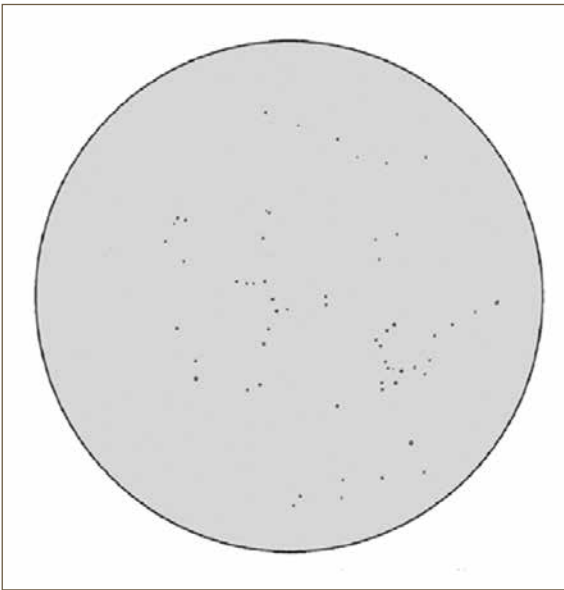
The globular cluster **NGC 6760** settles around 1.7 degrees further to the south-east of NGC 6749. The object hangs like a bright, frosted ball against the star field, slightly elongated in a north-south direction with faint pricks of starlight dotting its dusty surface and fringy edge. The northern part appears denser.



NGC 6760 – Globular Cluster
Photograph: CloudyNights

The "Phantom Streak Nebula" finds its home 2.5 degrees further south-west of NGC 6760. The planetary nebula **NGC 6741**, is a difficult object to discern, situated in a curving line with a few stars. It appears star-like, however, with an oxygen (O-III) filter the object appears as a hazy oval situated on the southern brink of the dark nebula LDN 617.

The galaxy **NGC 6814** up for discussion is situated in the southern part of Aquila, only 1.4 degrees from the Sagittarius border. This galaxy displays itself as a hazy, glowing ball of light. Higher magnification brings out a slightly brighter centre with the edge bathed in a hazy envelope. The lovely field of view displays a few bright stars taking a firm stand towards the north-west of the galaxy.



NGC 6843 and NGC 6840
Open Clusters

Two non-existent clusters are situated within a degree north from magnitude 5.2 phi Aquilae. The north-eastern group **NGC 6843**, contains a grouping of faint stars in a bent string. The brightest star in the star field is magnitude 7.7, situated south of the clusters. In the same field of view, **NGC 6840** shows up as a handful of faint stars in two linked groupings. The south-western part of the cluster appears loose with stars that connect the stringy group towards the north-east, giving an impression of hanging on a string.



The grouping **STREICHER 49** is situated only a degree south-east of the above clusters. The brighter magnitude 6.9 star, HD 190070, is situated at the southern end of the asterism. From this, fainter stars fan out towards the north-east in layers to complete what looks like a water sprinkler in action.

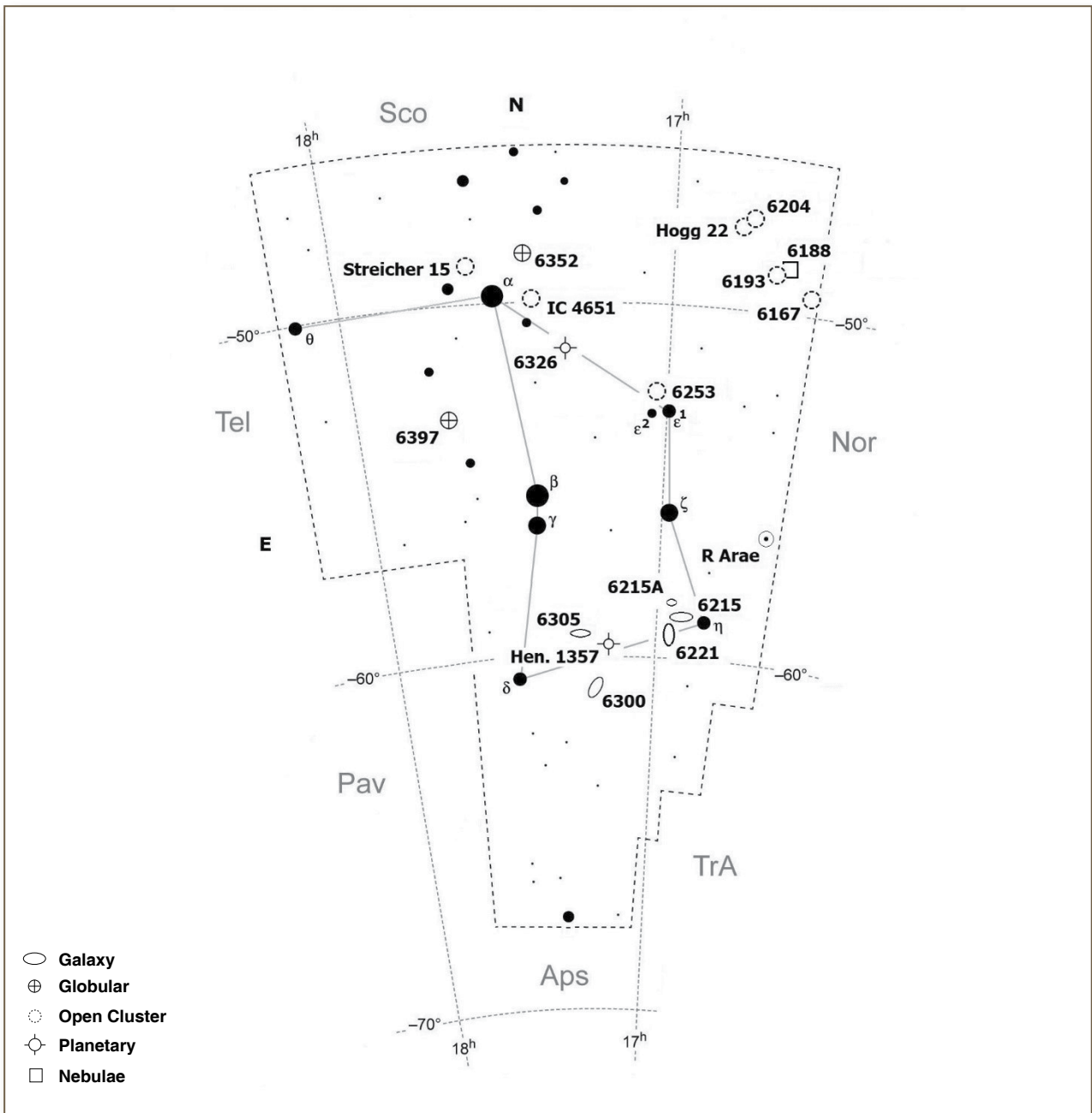
The map simulation of asterism STREICHER 49 shows the lengths and directions of the lines that represent the amounts of proper motion respectively. Asterisms can take on various forms, but their stars do not, in most cases, share a proper motion through space at all times (Wolfgang Steinicke).

The area around the south-eastern wing of the heavenly eagle houses a very unique object. Smith's Cloud was discovered by Gail Bieger Smith in 1963, who lives in Wassenaar, a small wealthy town west of Leiden in the Netherlands. This high-velocity cloud spans 15 degrees across the sky between eta and theta Aquilae and is 11 000 light-years long and 2500 light-years wide, crossing in on the Milky Way's plane at 70 kilometres per second (Australian Sky & Telescope Magazine July 2009).

The English astronomer Edward Pigott discovered the fluctuating light of the normally magnitude 3.5 yellow coloured star eta Aquilae in September 1784, one of the first to be described as a cepheid variable star with a period of 7.18 days and a visual range of magnitude 3.5 to 4.4.

Venture outside in the deep of the night and don't let the bats keep you from exploring the beauty of the starry skies!

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6709	Open Cluster	18h51m.5	+10°21'0	6.7	13'
NGC 6741	Planetary Nebula	19h02m.6	+00°26'9	10.8	6"
NGC 6749	Globular Cluster	19h05m.3	+01°54'3	12.4	6.3'
R Aquilae	Variable Star	19h06m.4	+08°14'0	5.5-12	*
V1548	Nova	19h07m.5	+11°45'0	11	*
NGC 6760	Globular Cluster	19h11m.2	+01°01'8	9.1	6.6'
NGC 6781	Planetary Nebula	19h18m.4	+06°32'4	11.8	109"
NGC 6803	Planetary Nebula	19h31m.3	+10°03'4	11.3	6"
NGC 6804	Planetary Nebula	19h31m.6	+09°13'5	12.2	31"
NGC 6814	Galaxy	19h42m.7	-10°19'5	11.2	3'x3'
NGC 6840	Open Cluster	19h55m.3	+12°07'5	10	5'
NGC 6843	Open Cluster	19h56m.1	+12°09'0	10.5	4'
STREICHER 49 DSH J2002.8+1056	Asterism	20h02m.9	+10°56'0	10.5	6'



The constellation of Ara

ARA

A Flame rises from the Altar

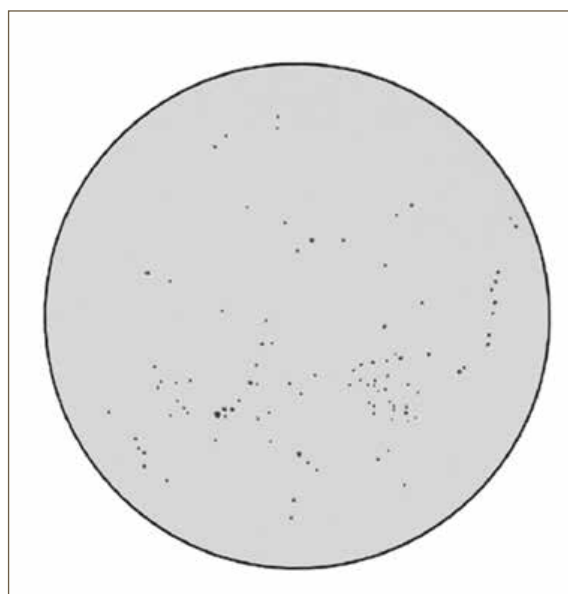
According to tradition Ara was the altar used by Centaurus the Centaur to offer sacrifices of animal origin. Fire is often seen as a symbol of destruction, yet it is difficult for us to grasp the anxiety and chaos that humans of antiquity must have experienced when a human or animal sacrifice was brought to the altar. The north-western area of Ara is the obvious place to start if one wants to get to know more about this constellation. This part of Ara, nestling on the outskirts of the Milky Way, is very dense in starlight, and ranked number 63 in terms of size, located between Norma to the west and Telescopium to the east.



Situated a mere 2 degrees from the boundary with Norma is the open cluster **NGC 6204**, one of the most outstanding compositions in combination with field stars. NGC 6204 is a well-balanced open cluster with about two dozen stars of mixed magnitudes.

The group **HOGG 22**, about 5' towards the east resembles a tight knot of stars towards the southern point of a long string, draped from north to south. If one continues along this extended line, the stars become increasingly fainter, with the faintest one marking the end of the line at the northern point. However, Mati Morel,

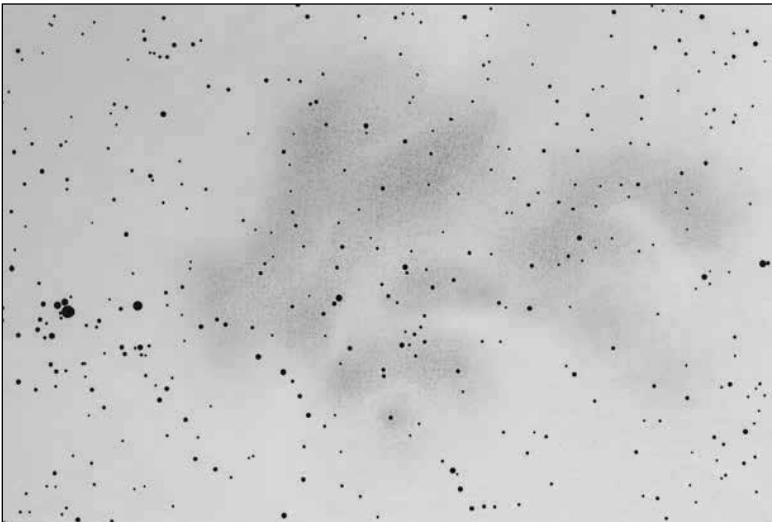
an Australian astronomer, has determined that Hogg 22 is a separate physical cluster from NGC 6204, although some sources list the stars concerned all in the same cluster, namely NGC 6204. Two more Hogg clusters can be found just further south: Hogg 20, situated on the southern brink of the cluster NGC 6200, which lies only 20' south of NGC 6204, and Hogg 21, only 20' further south-east from NGC 6200.



Hogg 22 and NGC 6204
Open Clusters

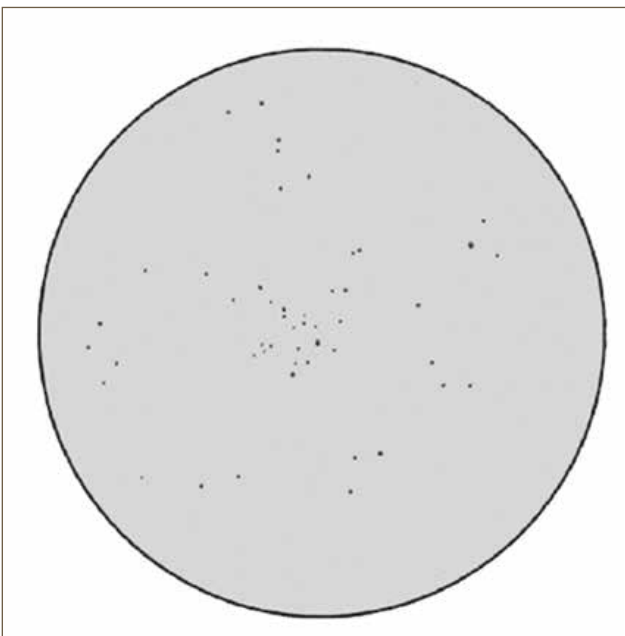
Continue along the boundary between Ara and Norma southwards to find yet another interesting combination, with an open cluster and a diffuse nebula.

NGC 6188 displays a relatively large area covered in a smoke-like cloud of gas and dust with parts quite well defined against the very dense star field. The almost transparent nebulosity hangs on slightly darker pieces, that fade away in the field of view. Make every effort to search out very dark night sky conditions to fully appreciate this network of nebulosity.



NGC 6193 and NGC 6188 – Open Cluster and Diffuse Nebula

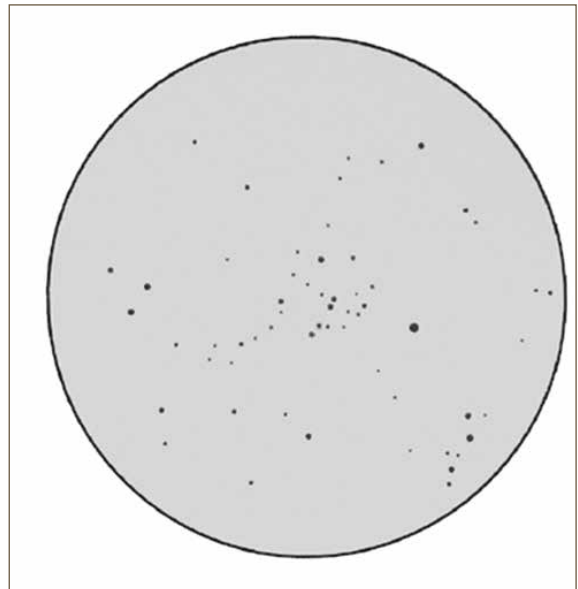
The cluster **NGC 6193** shines like an illuminated shopping centre on the eastern tip of NGC 6188. The group, with a few prominent bright blue stars and a mist of fainter light points, is clearly demarcated and could indicate a much larger group than anticipated. The beautiful double white-coloured star DUN 206 is situated on the western edge of the cluster and contains a magnitude 6 primary and a magnitude 7 companion with a separation of 10" in a position angle (PA) of 14°.



NGC 6167 – Open Cluster

A special cluster can be found a further 1.5 degrees south along this boundary. **NGC 6167** is a pretty open cluster with an outstanding shape. The group also known as Bennett 79a displays an almost V-shape, which could also be seen as a sort of zigzag formation running in a north-south direction. Star clusters in different patterns and shapes can be very interesting and provide endless pleasure to the observer.

More or less towards the centre of the constellation is epsilon Arae as the western supporting pillar of the altar. The open cluster **NGC 6253** is situated just 35' north from magnitude 4 epsilon Arae. The grouping, which is also known as Bennett 84, is a large, rich, swarming cluster of faint stars in an elongated cone shape spreading out from an easterly point towards the west. The northern part of the cluster displays a slightly bulgy shape with a more flattened southern part. With my wild imagination it is also possible for me to visualise it as the shape of an Australian kangaroo.

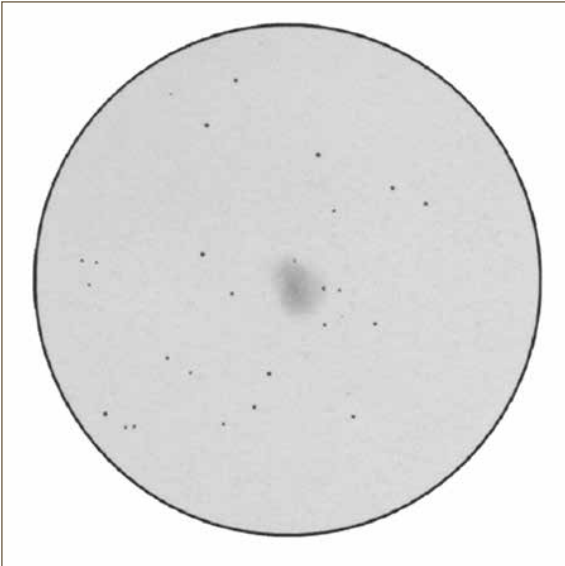


NGC 6253 – Open Cluster

The star zeta Arae is situated 3 degrees south of epsilon and is like no other star in this constellation. Although this orange-coloured star proudly displays a magnitude of 3 and represents the western part of the altar dish, it is also very distant.

Halfway between zeta and eta Arae is the very interesting star R Arae the visual duplicity of which was discovered by John Herschel (h 4866) who called it "a beautiful star". The star is in fact an Algol-type system being an eclipsing binary with a magnitude varying between 6 and 6.9 over a period of exactly 4 days, 10 hours and 12 minutes. To make it more intriguing, there is also a magnitude 8 star, just 3.5" to the south-east. However, be particularly sharp in your observation, because the star field surrounding this star is packed with stars of various magnitudes. It would be best to make use of a star map.

The stars delta and eta Arae are in the firing line, as they represent the brim of the volcano-like cooking pot. The galaxy **NGC 6215** is situated barely 10' north-east of the magnitude 3.8 eta Arae, a lovely orange-coloured star. If you can obscure the star, the galaxy which displays a hazy oval shape and slightly brighter nucleus, will be easier to observe. What is not so easy to spot, is the companion galaxy **NGC 6215A**, which is a further 12' eastwards and visible only as a faint, hazy smear of light.



NGC 6221 - Galaxy

The third galaxy in the field and perhaps the easiest of the trio to spot, is **NGC 6221**, situated 25' south-east from eta Arae. The galaxy is fairly large, bright and appears to form a north-south oval. Careful observation brings to the fore an uneven surface with a patchy feeling to it, which hints at a spiral structure. The nucleus is relatively bright, and with high magnification, it brightens up to a stellar point. The galaxy is about 70 million light-years away.

A very special planetary nebula is situated virtually in the midst of the flames, halfway between the two stars delta and eta Arae. This object is special, because it is one of Hubble's greatest images and bears the name Stingray Nebula, listed as **HENIZE 1357** or Hen. 1357 for short. It is still a proto-planetary nebula in which the gas had not yet become hot and ionized, one of the youngest known, formed possibly as recently as 200 years ago and lies about 18 000 light-years away. The central magnitude 8.4 star, has a companion at a position angle (PA) of 70°. The Hubble picture of Hen. 1357 shows a ring of gas slightly coloured light green towards the centre. Curved red lines represent gas heated by a shock wind interacting with the surrounding gas. The object is named after the astronomer Karl Henize who compiled a list of unusual objects in the 1950s.

The galaxy **NGC 6305** is situated only 25' towards the north-east and displays a soft, circular glow. However, two lovely yellow stars flank the galaxy on the south-eastern and north-western sides.



NGC 6300 – Photograph: In-The-Sky

The barred spiral galaxy **NGC 6300** is situated 2.5 degrees south of magnitude 3.5 delta Arae. The galaxy displays a nice oval in a north-west to south-east direction. With higher magnification the surface hints at some structure with a relatively bright bar-like nucleus.

Move away from this burning spot into the eastern part to detect Ara's showpiece. The globular cluster **NGC 6397**, situated towards the east of the two brightest stars alpha and beta Arae was discovered by Lacaille about 1751. This is an exceptional object with all the observing elements that one could find in a globular cluster, large, bright and round in shape. It has well-resolved star trails intermittently shaped like arms, and speckled dark sections in between. It appears slightly elongated in a north-west to south-east direction, which gives it a three-dimensional feeling. The globular cluster displays a mass of various magnitude stars with a few blue stragglers bunched together. The core impresses me most: it appears completely tight, but higher magnification reveals very faint pin-point stars which are barely visible. A smaller unresolved knot of faint stars can be seen towards the north-east edge. What a breath-taking naked-eye object, about 8700 light-years away!



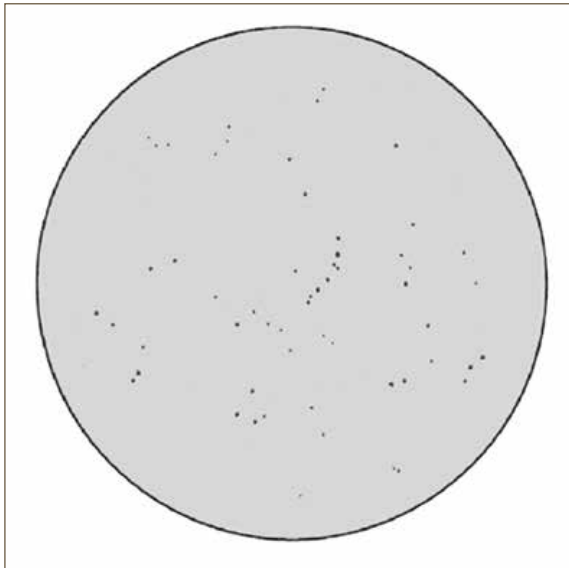
NGC 6397 – Globular Cluster
Photograph: ESA/Hubble

Well out of the fiery danger zone, situated between the pillars that hold the burning altar pot, is the planetary nebula **NGC 6326** about 2.5 degrees south of alpha Arae. The planetary nebula displays a soft misty disc in a slightly grey colour. Higher magnification brings out a more defined shape and it can be lifted out from the background star field with the help of an oxygen (O-III) filter. An uneven half-moon string of stars runs on the eastern side of the planetary nebula for almost 10' long.



NGC 6326 – Planetary Nebula
Photograph: Wikipedia

The exceptional silver metallic coloured magnitude 3 alpha Arae is also a double star with a magnitude 11 companion, a separation of 55" and a position angle (PA) of 172°. **IC 4651**, an open cluster with a difference is situated only one degree west of alpha Arae. The focus of the grouping is a very dense knot of stars. The northern part displays a handful of brighter stars that mingle well with fainter members. Obvious dark areas can be seen between cluster members. This is what I call a "patchy cluster!"



STREICHER 15 - Asterism

Situated 1.5 degrees north-east of alpha Arae is the asterism **STREICHER 15**, which contains a few stars, well defined against the star field. The brightest star magnitude 6.3 appears light yellow in colour and visible at the north-end of the string of stars snaking southwards. A magnitude 10 double star ends off the southern tip of the string. Star strings may resemble different shapes, and to me this grouping resembles swallows diving in flight. One could also imagine it as a Chinese hat.

Another 2.5 degrees further west from the asterism, is the globular cluster **NGC 6352**, situated inside the diffuse emission nebula GN 17.24.4. The globular cluster, approximately 25 000 light-years distant, appears as a soft round smear, unresolved and embedded among the faint field stars. With averted vision it appears somewhat granular. With real high magnification the twinkling stars give this globular a glitter-ball effect, with a faint hazy outer envelope. Dark spots and thin dark lanes are visible in the slightly more compact centre. James Dunlop discovered this globular cluster, and adds it as number 417 on his list.

The stake and sacrificial practices long died out, but the constellation Ara is a quiet reminder of a practice that justified such phenomena. Fortunately, the constellation offers a wealth of splendid objects that will warm the heart on balmy southern summer evenings.

Karl Henize worked at the Bloemfontein Lamont-Hussey Observatory in South Africa, conducting an objective-prism survey of the southern sky for stars and nebulae showing hydrogen emission lines, and compiled a catalogue of the objects he discovered.



A complex Emission Nebulae (H II regions) labelled from Karl Henize 1956 Catalogue. Some central cores indicated clusters with relatively high surface brightness.

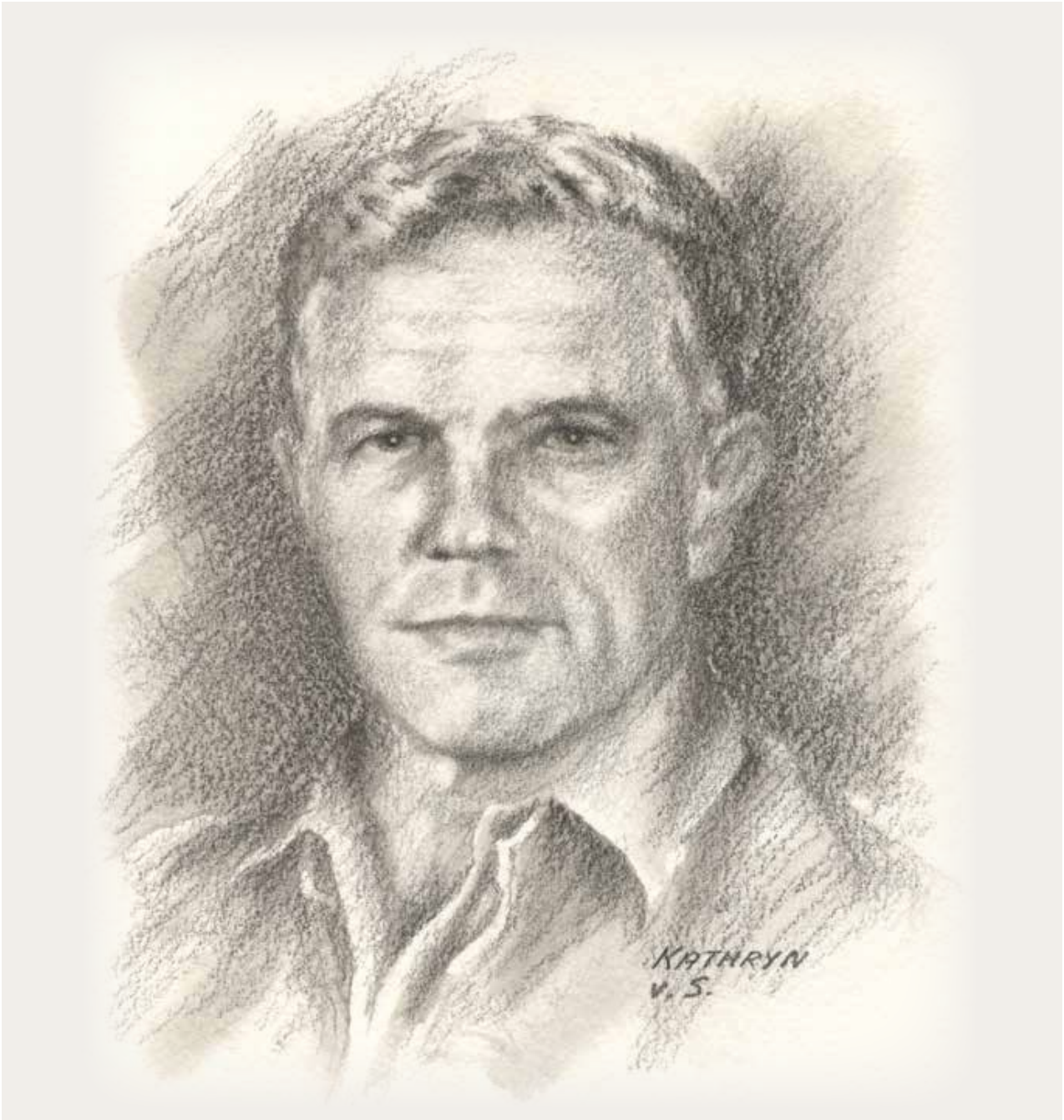
Photographs: Johan Moolman

The Lamont-Hussey Observatory
Photograph: Tim Cooper



The old and dilapidated observatory of astronomer Karl Henize on Naval Hill in Bloemfontein, South Africa.

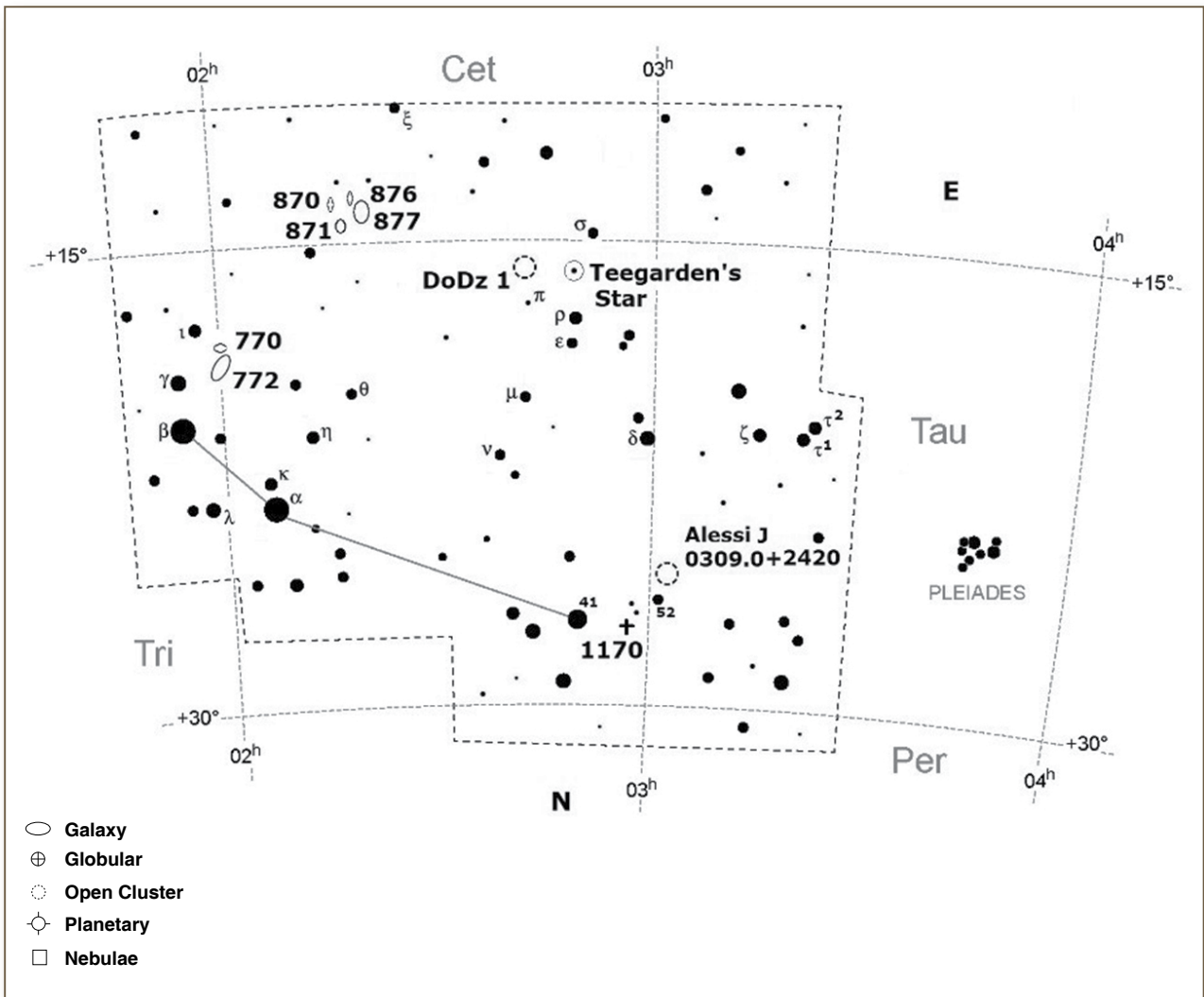
Photograph: Tim Cooper



Pencil Sketch: Kathryn van Schalkwyk (original photograph: NASA)

Karl Gordon Henize was born on 17 October 1926 in Cincinnati, Ohio, and died on 5 October 1993 from high-altitude sickness on the slopes of Mount Everest while attempting to climb the peak. Henize was an astronomer, space scientist and astronaut who had to wait 18 years for a flight. He was a crew member on Space Shuttle Challenger in July/August 1985. In accordance with his previously expressed wishes he was buried on Changste glacier, Mountain Everest.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6167	Open Cluster	16h34m.4	-49°36'.3	6.7	7'
NGC 6188	Diffuse Nebula	16h40m.5	-48°47'.0	-	20'
NGC 6193	Open Cluster	16h41m.3	-48°45'.8	5.2	14'
NGC 6204	Open Cluster	16h46m.5	-47°01'.0	8.2	5'
HOGG 22	Open Cluster	16h46m.6	-47°04'.8	6.7	2'
NGC 6215	Galaxy	16h51m.1	-58°59'.0	10.9	2.7'×2.2'
NGC 6215A	Galaxy	16h52m.8	-58°56'.0	13.4	1.9'×0.6'
NGC 6221	Galaxy	16h52m.8	-59°13'.1	10.1	4.9'×3.2'
NGC 6253	Open Cluster	16h59m.1	-52°43'.1	10.2	5'
HENIZE 1357	Planetary Nebula	17h16m.4	-59°29'.4	10.7	90"
NGC 6300	Galaxy	17h17m.0	-62°49'.0	10.1	5.2'×3.3'
NGC 6305	Galaxy	17h18m.0	-59°10'.3	13	1.8'×1.2'
NGC 6326	Planetary Nebula	17h20m.8	-51°45'.0	11	14"
IC 4651	Open Cluster	17h24m.7	-49°57'.0	6.9	12'
NGC 6352	Globular Cluster	17h25m.5	-48°25'.3	8.1	7.1'
STREICHER 15 DSH J1734.6-4835	Asterism	17h34m.6	-48°35'.0	6	15'
NGC 6397	Globular Cluster	17h40m.7	-53°40'.0	5.8	25.7'



The constellation of Aries



NGC 870, NGC 871, NGC 876 and NGC 877 – Galaxies
Picture: Adam Block

ARIES

A Bee, an Apes or perhaps a Vespa

Dutchman Peters Plancius had visualised a bee, which he called Apes, out of a small swarm of fainter stars hovering over the back of the constellation Aries, the Ram. The German Jacob Bartsch didn't have the same bee in his bonnet, he renamed the group Vespa, the wasp. By the time we eventually get to Johannes Hevelius 1690 Star Atlas, the bug lost its sting as the northern fly and he consigned it to Aries, one of the smallest constellations of ancient times.



Aries the Ram is a constellation that is somewhat mystifying, as it is almost impossible to find such an animal impression in the composition of the stars. Three visible stars – alpha, beta and gamma Arietis – are the only indication of the constellation and relatively easy to find.

Aries holds a few surprises among the stars representing its image. Ever wondered where there might be an NGC or IC object that has really been confused with a comet? Brian Skiff, a professional astronomer of Lowell Observatory, would like to mention the case of NGC 1170, found by Charles Pierce with the Harvard 15-inch refractor on 31 December 1869 in the constellation Aries. It could be a part of the tail of comet Tempel-Swift. If this object was on your list to do, there is no way that you will find it at the indicated position of 2 degrees west of 52 Arietis. However, Skiff indicates that IC 2120 in the constellation Auriga is the only “missing” object that he knows of that is confirmedly linked with a comet.

A beautiful asterism, **ALESSI J0309.0+2420**, can be found a degree south of 52 Arietis and was discovered by Bruno Alessi. This is one of Alessi's unique grouping of stars, displaying a handful of magnitude 11 stars somewhat in the form of a Robin Hood shoe, with the base towards the south. The stars to the east are slightly brighter than the other members.

A double star which has a story to tell is lambda Arietis situated 2 degrees west of alpha Arietis. A lovely pair clearly separated by a magnitude 4.9 primary in a yellow-white colour while the companion, magnitude 7.7, appears blue-grey with a separation of 37.4" and position angle (PA) of 46°. Some amateurs claim they can spot a greenish colour to the companion star; this is hard to believe, but the double star perhaps provides a true glimpse of this statement. Due to the colour contrast between the two stars the eye of the beholder can easily be fooled. The Sky Catalogue 2000.0 also listed an AC and AD companions.



NGC 772 and NGC 770 – Galaxies
Photograph: Wikipedia

The brightest galaxy on offer in the constellation is **NGC 772**, which displays a roundish hazy shape at first glance. It brightens to a striking nucleus with a misty envelope. The satellite galaxy **NGC 770**, is situated 5' to the south. The pair can be found barely a degree east of gamma Arietis.

In the far western corner of Aries is a group of four galaxies accompanied by two bright stars. The western pair **NGC 870** and **NGC 871** has an 8.6 white-coloured star towards the south. Barely 10' towards the east are the two galaxies **NGC 876** and **NGC 877** with a magnitude 7.6 yellowish star towards the south. Compositions of deep space objects like these are indeed rare, but an observation through a telescope is exciting. NGC 877 is the easiest of these four galaxies to spot, with a magnitude of 11.8 in a hazy roundish shape. All four galaxies are situated in only an 18' field of view.

Half a degree south-west of sigma Arietis is the open cluster **DoDz 1**, named after the astronomers Madona V. Dolidze and I.G. Dzimselejsvili. This is a lovely grouping, consisting of about a dozen stars, which is outstanding against the background star field. The sharp end of the group points towards the south with a double star consisting of a yellowish magnitude 8.5 primary and magnitude 12.7 companion with a separation of 29.4" and position angle (PA) of 342°, listed as 02474+1713.2 in the Washington Double Star Catalogue (WDS). This double star at the southern tip was observed by Tim Cooper and myself on the night of 30 October 2005. To our surprise, and after further investigation by Cooper on Digitized Sky Survey (DSS) plates, it showed a possible third companion which



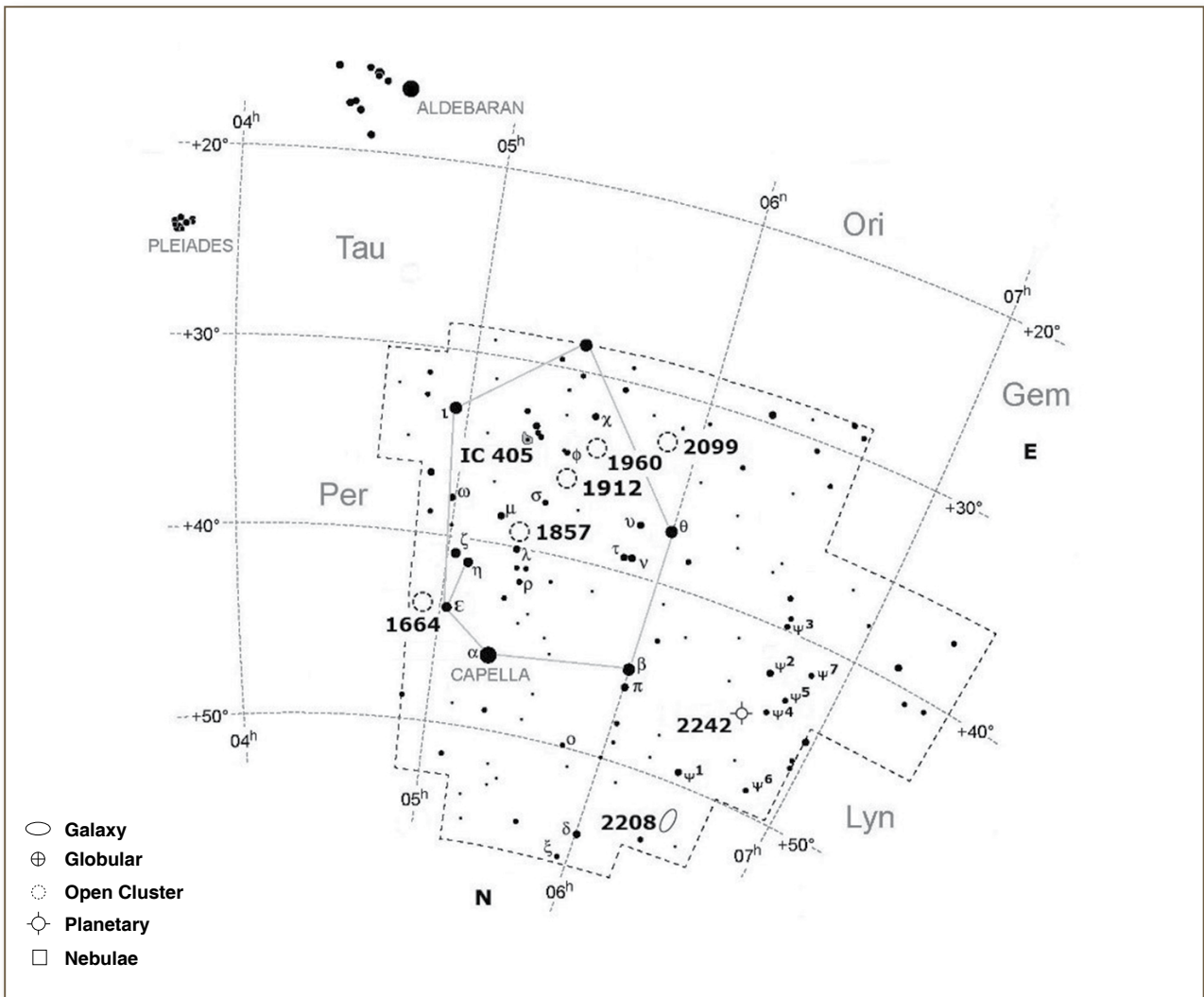
DoDz 1 – Open Cluster
Photograph: Wikipedia

we estimated at around magnitude 15.5. We contacted Brian Skiff who noted that it looked as though the faint third component of the pair could possibly be a physical companion. The data are not all that good for such a faint star, but the 2 Macron All-Sky Survey (2MASS) colours at least do not totally exclude it. Hopefully observations of proper motion over time will include or exclude this star as a third companion to WDS02474+1713.2. When checking the proper motion of all stars, you are bound to get stars of similar proper motion through space.

This constellation has more surprises up its sleeve. A degree further east of DoDz 1 is Teegarden's star. This magnitude 15 red dwarf was discovered in 2002 in sky survey images by Bonnard Teegarden and his colleagues from NASA Goddard Space Flight Centre. Moving 5" per year suggested it is 7 to 10 light-years away – one of the very nearest stars to the sun. Tom Stafford observed the star on 16 nights from September 2003 to January 2005 and obtained the following results using reference points in the Second U.S. Naval Observatory Astrograph Catalogue (UCAC2). The proper motion of the star is RA: +0.2394s and DEC: -3.812" per year with a parallax of 0.250". From results announced by Allegheny Observatory in Pittsburgh, Pennsylvania observations made with the 0,76-metre Thaw refractor, based on a high-sensitive charge-coupled device (CCD), it turned out that the star is more or less 12 and a half light-years away. It is now listed on the website of the Research Consortium on Nearby Stars as the 23rd closest star. The star is situated between magnitude 5.5 sigma and magnitude 5.3 pi Arietis.

Wasps and bees are nowhere to be seen at night when the stars shine in their full glory, but it is the time to be out exploring the fascinating objects in the constellation Aries.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 770	Galaxy	01h59m.2	+18°57'.3	12.9	1'×0.7'
NGC 772	Galaxy	01h59m.3	+19°00'.4	10.3	7.3'×4.6'
NGC 870	Galaxy	02h17m.2	+14°33'.0	14	0.2'×0.2'
NGC 871	Galaxy	02h17m.2	+14°33'.4	13.6	1'×0.3'
NGC 876	Galaxy	02h17m.9	+14°31'.3	13.7	1.6'×0.6'
NGC 877	Galaxy	02h18m.0	+14°33'.8	11.9	2.1'×1.7'
DoDz 1	Open Cluster	02h47m.5	+17°15'.3	7.1	7.5'
TEEGARDEN'S STAR	Star	02h53m.2	+16°52'.5	15	*
ALESSI J 0309.0+2420	Asterism	03h09m.0	+24°20'.0	9.5	8'



The constellation of Auriga

AURIGA

The Coach Driver

The composition of some constellations can sometimes strike us as strange. The astronomers of old saw Auriga as a charioteer, and some saw a connection with a goat. Could the two have supported each other in the movement of the constellation? A charioteer or coach driver can be conjured up in one's imagination, well sort of.

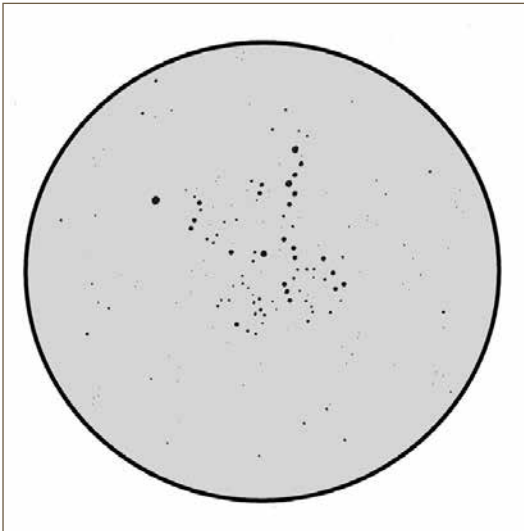


The constellation can be easily recognized against the northern night sky as a pentagon-shaped figure and does not disappoint the observer as far as its exceptional star grouping is concerned. The beacon star is the magnificent bright white magnitude 0.2 alpha Aurigae (Capella), carrying the name She-Goat, with the kid's epsilon, eta and zeta Aurigae. Capella is 42 light-years distant and has a companion star which turns out to be double as well. The royal temple in Porphora was named Fa'anui in honour of the golden star Capella. Local chiefs were invested with a girdle of yellow feathers that symbolised their greatness.

The magnitude 2.9 epsilon Aurigae is an interesting eclipsing star, a super-giant Type-F star 2000 light-years distant. Although a secondary has never been seen and shows no spectrum, emits no infra-red radiation, and is silent at radio wavelengths, it was a puzzle. One of the suggestions is that it is a much smaller star surrounded by a shell of semi-opaque material. The German astronomer Johann Fritsch first reported the dimming of epsilon Aurigae in 1821. In 1847 Friedrich W. Argelander and Edward Heis tracked the next dimming. Only in 1982–1984 did astronomers have the equipment to observe the system in enough detail to suggest that a long dark object partially occults it every 27.1 years. I followed the dimming of epsilon Aurigae in the year 2010, from where epsilon Aurigae looks much fainter than eta and zeta Aurigae.

The constellation is popularly known as having spoiled with three relatively bright Messier open clusters, seen even with the naked eye in very dark skies. The first of the three in question is **NGC 2099**, Messier 37, a cluster with a lot of detail situated towards the southern part of the constellation. It is a bright grouping with mixed-magnitude stars in a cartwheel shape with curls and strings running out like sprouting arms from a relatively compact middle. Dark voids are randomly visible and wind their way between the members, with a striking orange star standing out towards the middle area. It has a bulk of almost 150 Type-A stars and was discovered by Charles Messier in 1764. Amateurs reckon it is the most beautiful cluster in Auriga and call it the Gold Dust Cluster.

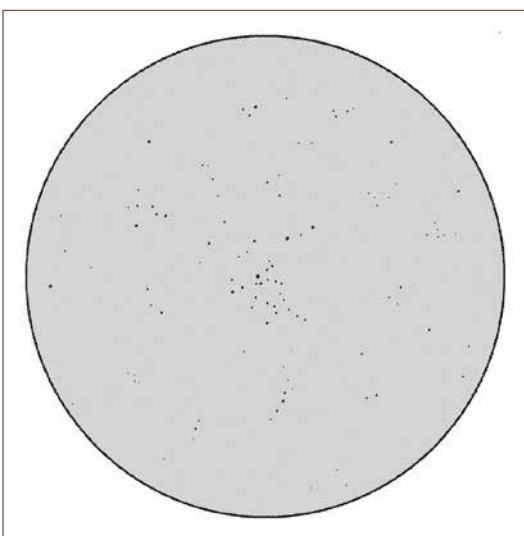
The smallest of the three Messier groupings is **NGC 1960**, known as Messier 36, very attractive in its own right situated 3.5 degrees west. It is well outstanding against the background star field and irregular with more or less three dozen stars, slightly compressed to the middle area with a handful of look-a-like double stars. This young cluster was discovered by Guillaume Le Gentil in 1749 and 4100 light-years away from us.



NGC 1912 - M38 - Open Cluster

A further 2.8 degrees east the fine open cluster **NGC 1912**, better known as Messier 38, is easy to find. M38 was discovered in 1749 by Le Gentil and seen as a very large grouping. The cluster is bright in a somewhat loosely square shape with various magnitude scattered stars. Brighter star strings resemble a figure (up-side-down) with its legs standing apart with virtually no head on the shoulders. The southern part seems denser, with a noticeable starless eastern part. The brightest magnitude 7.9 star is a yellow giant situated on the north-eastern edge of the grouping. Star outliers

extend to the south, reaching almost to the open cluster NGC 1907, a tiny puff of smoke. M38 is one of the older galactic clusters and contains about 120 stars in an area half the diameter of the full moon and 25 light-years across. It has been referred to as a kite shape with two leading arms. Charles Messier noted the centre arranged in a distinct cross. It is an outstanding grouping proudly showing off its beauty.



NGC 1857 - Open Cluster

NGC 1857 can be found less than a degree south from 4.6 lambda Aurigae. It is a lovely, rich grouping with strings radiating out from the central area. Notable is the faint string swinging out towards the south. The faint grouping Czernik 20 forms part of the group as an extension towards the north.

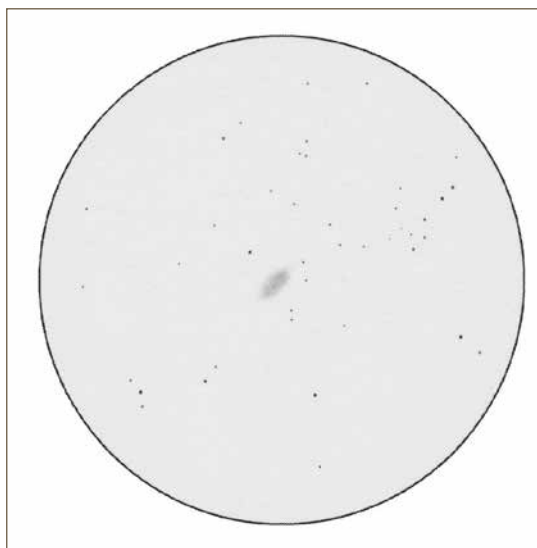
In the western part of the constellation is the famous Flaming Star Nebula, documented as **IC 405**. The haziness around the star fans out in see-through wisps caused by the glowing gas of the star. Apparently high magnification and filters are needed to explore the nebulosity around the star.

The open cluster **NGC 1664** can be seen barely 2 degrees west of epsilon Aurigae. The star grouping contains around 30 faint members in nice decorative chains, edging more north and spreading out towards the south. The cluster is situated on the border with the constellation Perseus.

Lesser known clusters like Berkeley, Dolidze, Stock, King and Collinder are well documented in the area, and with the use of a star map it can be enjoyable searching them out.

In the far northern corner of the constellation, the galaxy **NGC 2208** appears to be nothing but a very faint slightly extended south-east to north-west glow barely seen in only excellent dark starry skies with a reasonable large amateur telescope.

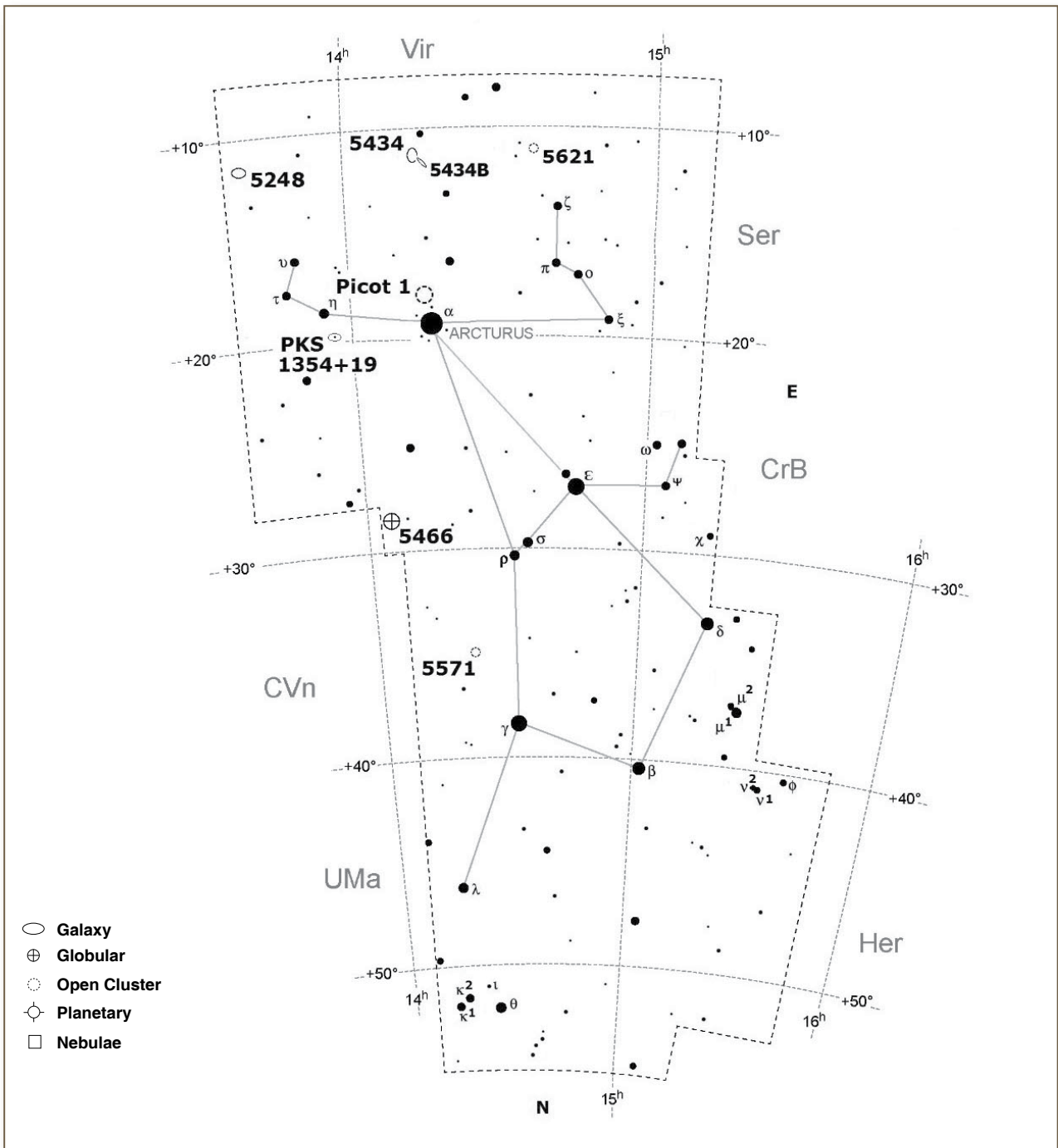
About 6 degrees east from beta Aurigae, the planetary nebula **NGC 2242** is on all counts faint and very small. However, with high magnification and excellent dark skies it shows off a round glow somewhat brighter towards the middle. The centre star is not visible.



NGC 2208 – Galaxy

The southern skies are rich in wonderful objects, but it's also worth searching out the northern skies, which do not disappoint at all.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1664	Open Cluster	04h51m.1	+43°42'.0	7.6	18'
IC 405	Reflecting Nebula	05h16m.2	+34°16'.3	10	20'×10'
NGC 1857	Open Cluster	05h20m.2	+39°20'.8	7	5'
NGC 1912 Messier 38	Open Cluster	05h28m.7	+35°50'.0	6.4	21'
NGC 1960 Messier 36	Open Cluster	05h36m.1	+34°08'.3	6	12'
NGC 2099 Messier 37	Open Cluster	05h52m.4	+32°33'.1	5.6	18'
NGC 2208	Galaxy	06h22m.5	+51°54'.5	13.8	1.6'×1.1'
NGC 2242	Planetary Nebula	06h34m.7	+44°46'.4	14.3	22"



The constellation of Boötes

BOOTES

The Slave Driver

Various amateurs have referred to Bootes as the constellation that does not in any way reflect its name. The constellation is supposed to represent a herdsman (a worker) who is pushing the Great Bear (Ursa Major) through the heaven by the tail, or chasing it with his hunting dogs Canes Venatici. He was also seen as the son of Jupiter and Callisto. Homer and Hesiod mentioned the starry figure because this is one of those constellations that they simply do not have another name or explanation for.

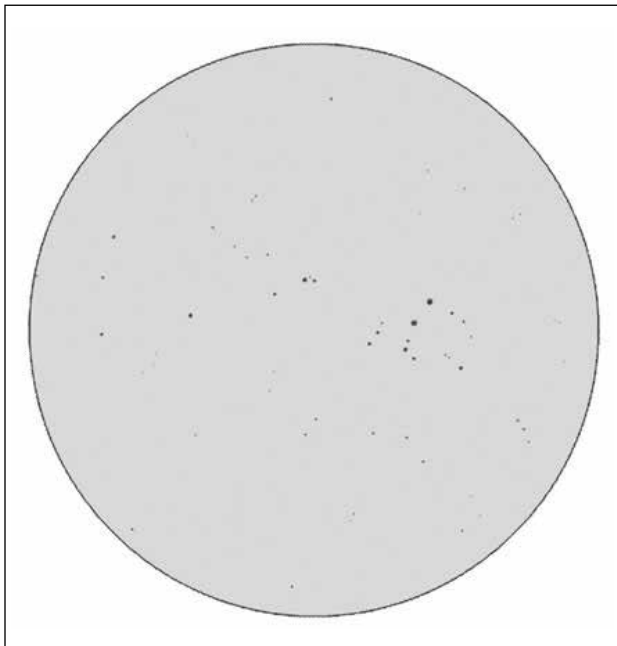


Well, what is so special about the constellation? you may ask. Its brightest star, magnitude 0.1 is none other than Arcturus or alpha Bootis and one of the first stars to be named. In ancient times the star was most probably the first indication that there might be a pole in question. The Chinese called Arcturus "Ta Kio", or more to the point, the emperor's palace with the three fainter stars on its western side, eta, tau and upsilon Bootis the leaders.

Early drawings show Arcturus as the sword or dagger simply because it is so prominent. The star was probably the first to be seen in daytime through a telescope. Arcturus is surely one of the most exceptional stars showing off various colours when it glitters at night against the northern horizon in a display of rosy to metallic blue colours. In my view this is the loveliest star by far to grace the starry skies. Julio Navarro of the University of Victoria in Canada believes that Arcturus seems to have come from another galaxy born 5–8 billion years ago, speeding through our stellar neighbourhood at 120 kilometres per second. Because of the high speed it is also estimated to be the flattest star and therefore perhaps distorted. The star indicates the one knee of this strange man carved out of stars.

The constellation is home to a number of galaxies as well as clusters of galaxies. It is not easy to observe these clusters, but with a little effort and transparent dark skies it is possible. One of the more accessible to search out is the galaxy **NGC 5434**. This group consists of 10 galaxies in a mere 40' field of view 2 degrees north of the border with Virgo. Most of them are in the range of magnitude 13 plus. **NGC 5434B** interacting the largest galaxy, NGC 5434, on its north-eastern edge. The group's members are NGC 5409, 5416, 5423, 5424, 5431, 5434, 5434B, 5436, 5437 and 5438. Towards the north of the group a yellow-coloured magnitude 6.2 star shows the way. At most only one or two of the members can be glimpsed on an excellent dark night of observing.

But one should not ever give up hope – on the western edge of the constellation Bootes is another galaxy which might be an easier task to fulfil. **NGC 5248** comes to light as a hazy oval in an east to west direction. However, it has a pretty bright nucleus and with higher magnification a few darker spots can be glimpsed on its surface, the most prominent of which is perhaps towards the brighter southern part, which could indicate spiral structure. Lord Ross notes it as “large pretty bright, maybe a lower branch joins the nucleus or continuation of upper curve.”



NGC 5621 – Open Cluster

The indicated number **NGC 5621** is somewhat of a mystery. The object is situated towards the southern edge of the constellation. The catalogue *Star Clusters* (Brent A. Archinal and Steve J. Hynes) indicates a string of three faint stars. However, several strings of three close stars appears to be in the surrounding star field, of which a triangle of faint stars situated closer to the indicated position. The galaxies NGC 5665 and 5665A are situated a degree east, but it is most probably the faintest string of stars that are in play here.

The star field around Arcturus is sprinkled with both faint and brighter stars. The stars accompanying this famous star are now known as the Arcturus Group with around 9 stars of magnitude 7. **PICOT 1**, is a nice little asterism situated 35' towards the south in an east-west direction. Seven stars ranging from magnitude 9 to 10.5 are nicely spaced and create a sort of question mark shape. Fulbert Picot, the French astronomer, called it Napoleon's Hat, while Ken Hewitt-White sees the 7 stars as a cosmic caterpillar humped up in mid-crawl – I agree with him on this one.

Nearly hanging on to the constellation Canes Venatici border is a lone globular cluster, **NGC 5466**, which at first appears as a hazy glow. Faint star points come to light during observation through a medium size telescope, but the core seems to be an unresolved haze. The shape is somewhat uneven, not quite round, with a short string of very faint stars curling its way out towards the south-eastern side. The western side of the globular seems denser in starlight. Parts of the edge seems slightly rough, which indicates faint stars.

Halfway between magnitude 3.5 rho and magnitude 3 gamma Bootis is another proclaimed asterism, but this one has a name, **NGC 5571**. This asterism is situated only 5' east of the galaxy NGC 5567. Between the stars in the field of view several faint galaxies found a home, but far too faint to even glimpse.

Bootes lacks known open clusters and nebulae, but does not disappoint us, with a quasar, **PKS 1354+19**, situated about a degree north of eta Bootis. This quasar, nearly 10 billion light-years away harbours a monstrous black hole in its centre. It is believed to be one of the most massive, distant galaxies with an enormous output of energy.

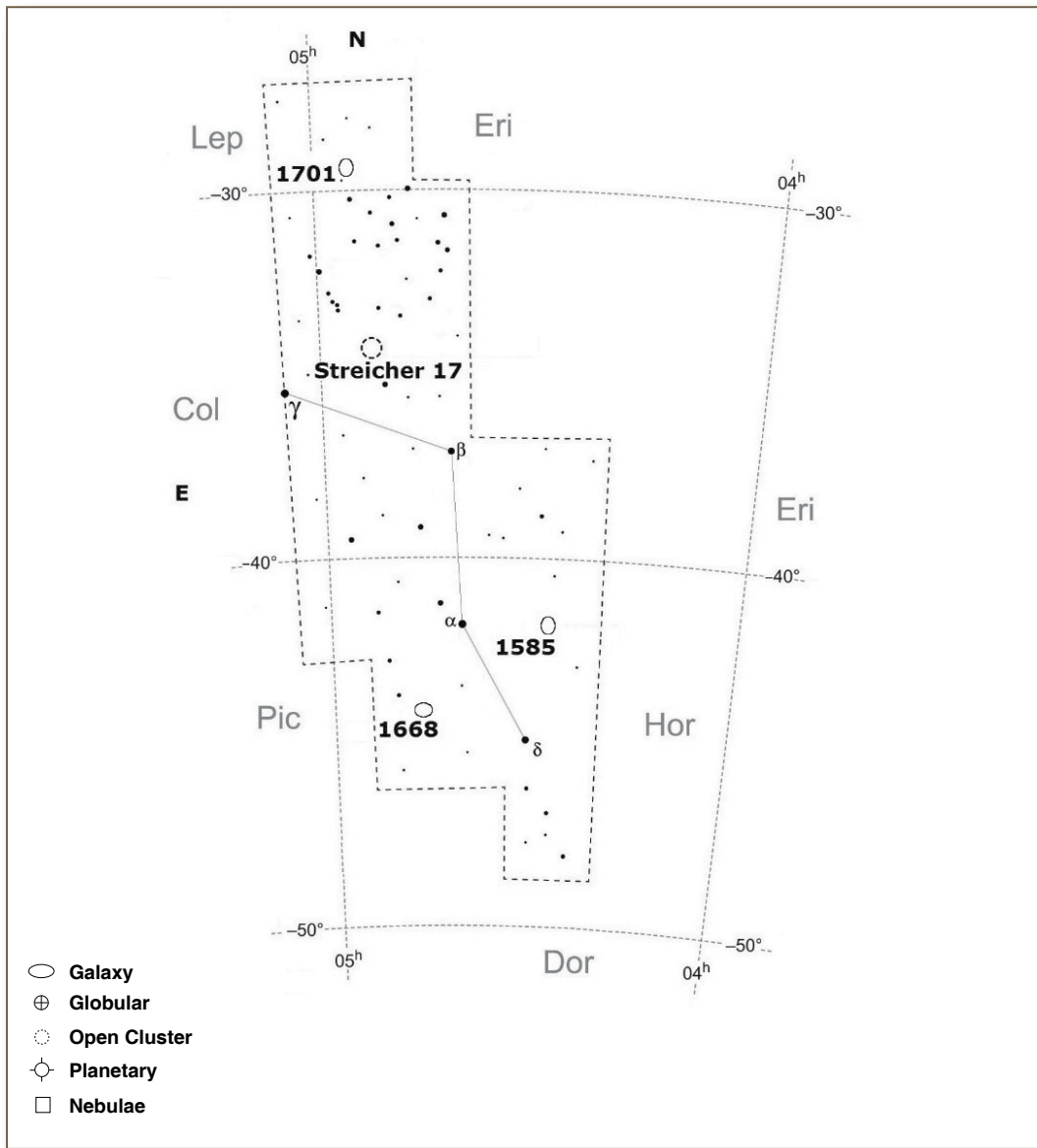


NGC 5571 – Photograph: DSS

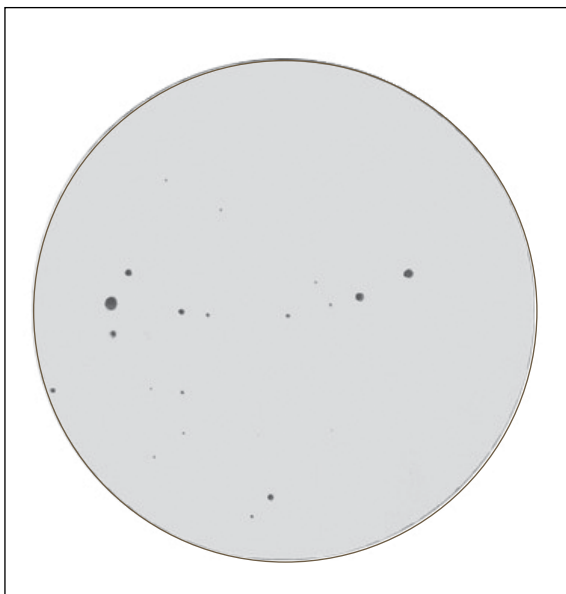
The star Nekkar, perhaps better known as beta Bootis, marks the head of this figure with magnitude 3 gamma Bootis the left shoulder and delta Bootis the right, together the stars truly do have the shape of a kite.

Although it is a northern constellation, its shape is very outstanding, so take the Herdsman by its arm and search out the soft cotton balls in the area close to the most beautiful star, Arcturus.

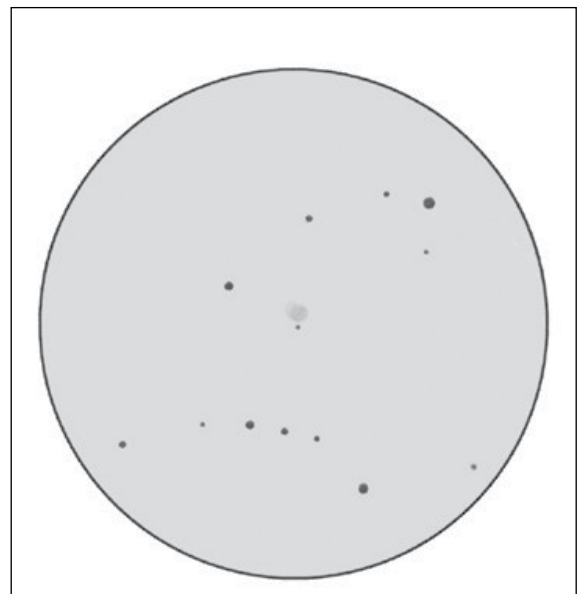
OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5248	Galaxy	13h37m.5	+08°53'.8	10.3	6.2'×4.6'
PKS 1354+19	Quasar	13h54m.0	+19°44'.5	16	10"
NGC 5434	Galaxy	14h03m.4	+09°26'.9	12.9	1.8'×1.8'
NGC 5434B	Galaxy	14h03m.5	+09°28'.0	13.6	1.6'×0.3'
NGC 5466	Globular Cluster	14h05m.5	+28°32'.4	9	11'
PICOT 1	Asterism	14h15m.0	+18°35'.0	9.8	20'
NGC 5571	Grouping	14h19m.6	+35°09'.4"	9.5	2'
NGC 5621	Grouping	14h27m.8	+08°15'.0	7	8'



The constellation of Caelum



STREICHER 17 – Asterism



NGC 1585 – Galaxy

CAELUM

The Ancient Tool

The constellation Caelum was formed by La Caille from stars between Eridanus and Dorado, referring to it as the graving tool of ancient times.

In the northern part of Caelum is the extremely small and very faint galaxy **NGC 1701**, situated in a virtually starless field of view. The galaxy displays itself as a round, soft whirl of mist along with an approximate magnitude 9 star situated close to the galaxy's eastern end.

While observing the galaxy NGC 1687 my attention was drawn by a string of stars approximately 15' to the south. **STREICHER 17**, in a sort of arrow shape is formed by a few stars of varying brilliance.

The brightest star, a lovely yellowish coloured magnitude 6.6, HD 31142, cover the eastern end. The centre comprises of fainter stars, with slightly brighter stars extends further west towards the tail end.

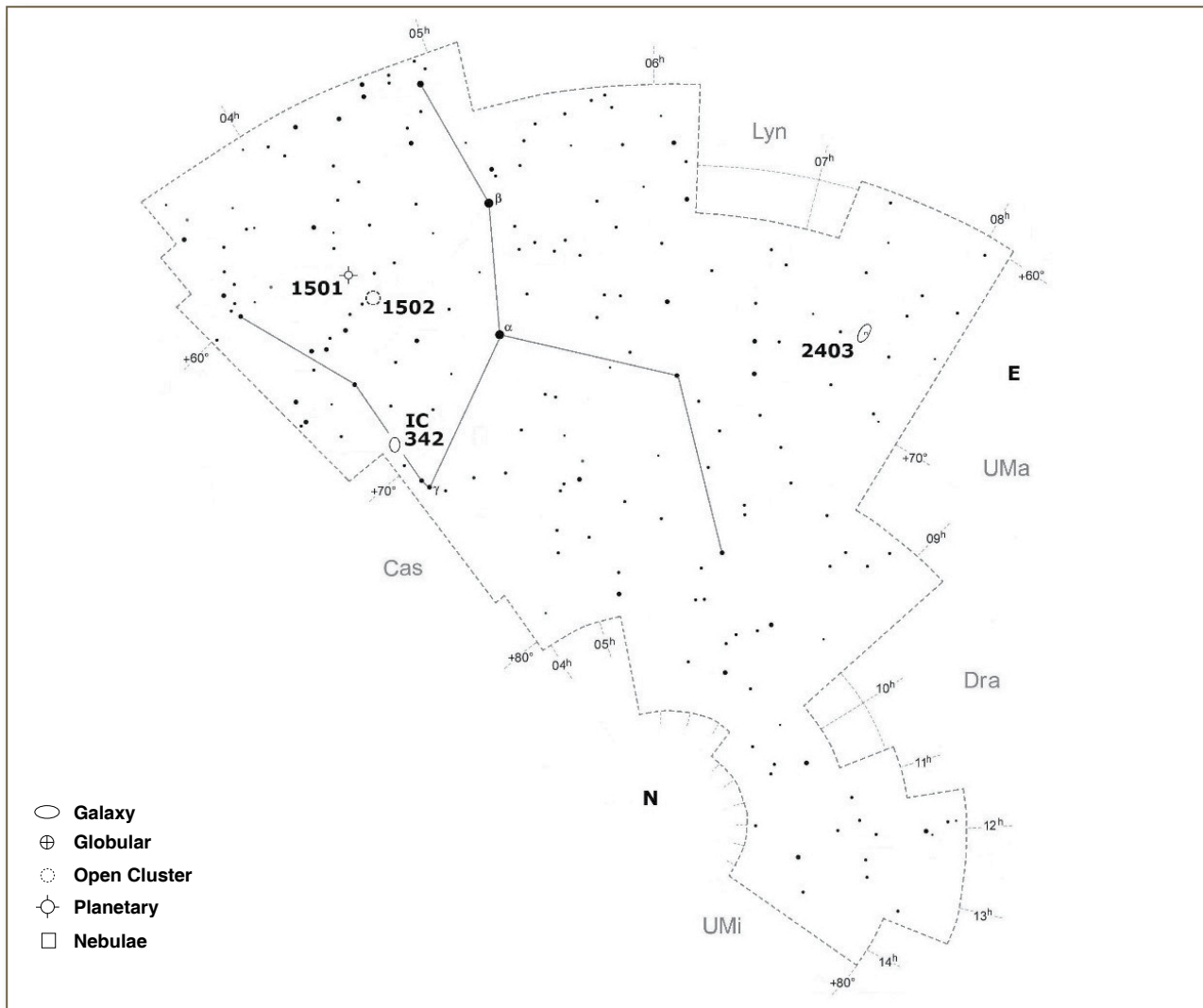
The galaxy **NGC 1585** displays a small oval glow, which is more apparent when using averted vision. It seems slightly washed-out to the east, with a defined western side. The nucleus is slightly brighter with a veil-like haziness covering the whole surface. A companion galaxy IC 2068 is situated only 11' towards the north-west. The pair is just 2.5 degrees west of alpha Caeli.

Galaxy **NGC 1668** can surprisingly be identified without difficulty just south of a few magnitude 12 stars. An extremely faint star is situated on the northern outer brink of the galaxy.

The beauty of the night skies filled my life with sheer wonder.



OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1585	Galaxy	04h27m.5	-42°09.8	13	1.3'×0.9'
NGC 1668	Galaxy	04h46m.1	-44°43.6	12.5	1.5'×1'
STREICHER 17 DSH J0451.2-3414	Asterism	04h51m.2	-34°14'.0	7	17'
NGC 1701	Galaxy	04h55m.8	-29°53'.1	12.8	1.2'×1'



The constellation of Camelopardalis

NGC 2403 – Photograph:
APOD-NASA

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 342	Galaxy	03h46m.8	+68°06'.0	8.3	21'×22'
NGC 1501	Planetary Nebula	04h07m.2	+60°55'.1	11.5	52"
NGC 1502	Open Cluster	04h07m.8	+62°19'.8	5.7	7'
NGC 2403	Galaxy	07h36m.9	+65°36'.0	8.5	21.9'×12.3'

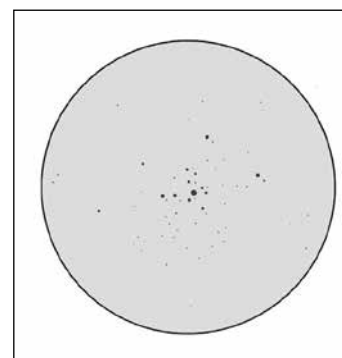
CAMELOPARDALIS

A Giraffe in the Sky

Camelopardalis the Giraffe is a modern constellation whose origin dates back to the 17th century. It is attributed to Dutch cartographer Petrus Plancius, who used it to fill an oddly shaped region of the stars that had not been assigned to any constellation. The constellation appears to be hiding on the northern edge of Draco and is completely out of view for observers in the southern hemisphere.



Surely one of the best-known star strings in all of the starry skies consisting of magnitude 7 to 9 stars is no other than Kemble's Cascade. The Canadian Lucien J. Kemble discovered this string cascading down for almost 2.5 degrees before splashing into the open cluster **NGC 1502**. The cluster stands out clearly from its relatively starless backdrop. It consists of about 45 stars of varied magnitude with the outstanding wide double star SWF 485 in its midst. Leland S. Copeland refers to NGC 1502 as the Golden Harp Cluster.



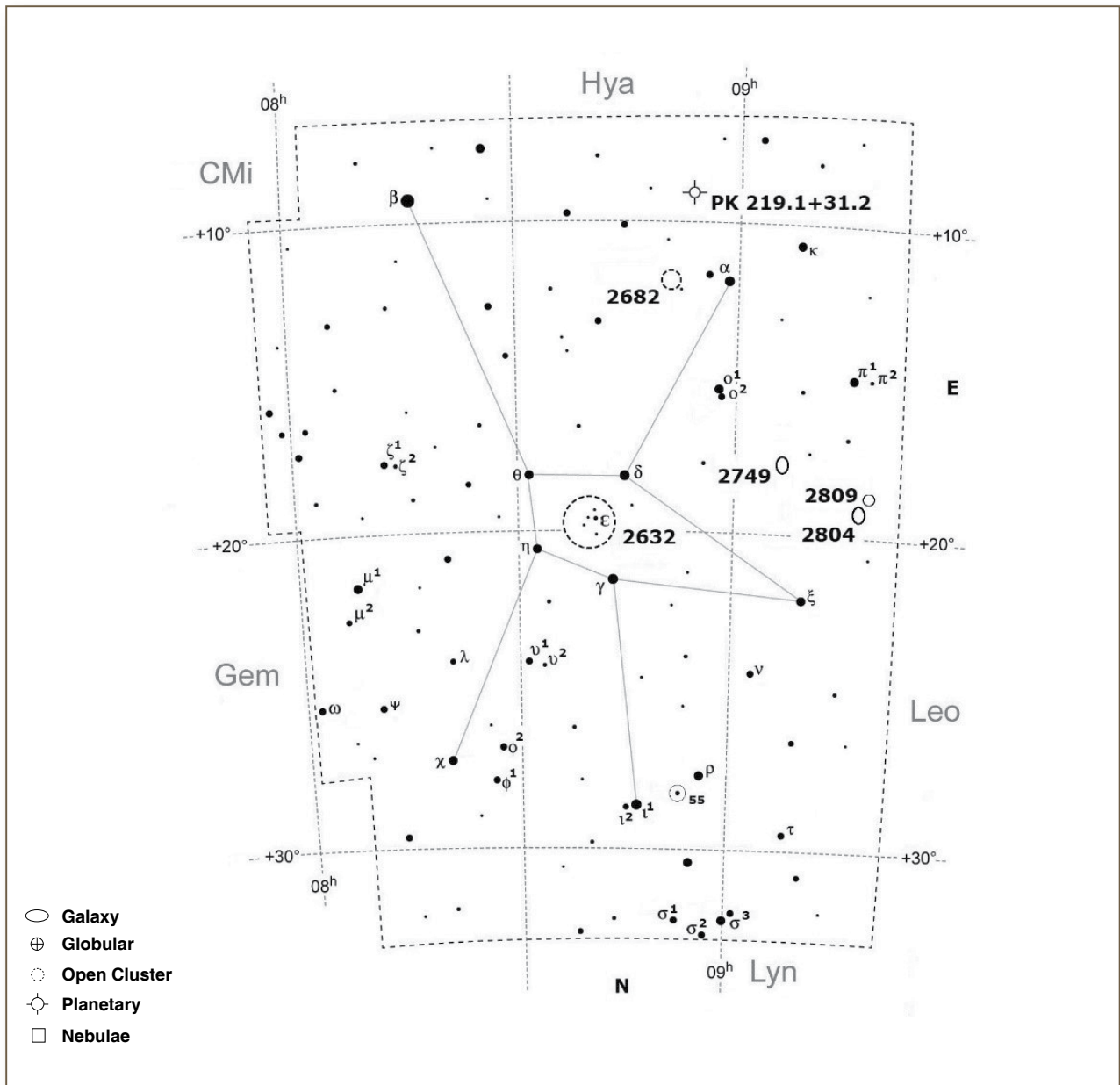
NGC 1502
Open Cluster

The planetary nebula **NGC 1501** shares this part of the skies 1.5 degrees south of NGC 1502. Although both the nebula and its central star are catalogued as nearly magnitude 12, the object is easier to find than these numbers suggest. It is round in shape, slightly small, with a very distinctive flowy blue-green shade.

A mere 3.5 degrees from the western boundary with Ursa Major is the galaxy **NGC 2403**, a large open spiral, slightly oval in shape. A few very faint stars and hazy knots are embedded into the galaxy's flimsy surface. With care a small bright nucleus and perhaps a spiral arm along a dark void can be spotted. A small piece of nebulosity listed as NGC 2404 is situated on the periphery of the eastern edge. The galaxy is about 8 million light-years away and is possibly an outlying member of the group of galaxies that includes M81 and M82 in Ursa Major.

South of gamma Camelopardali the galaxy **IC 342** can be found. It is an open spiral with a prominent nucleus and diffused outer halo. It is a fairly bright galaxy with quite a few faint stars, and nebulous knots on its surface, with an obvious string imbedded on the north western side.

The real giraffe as we know it is one of the most graceful animals in nature, and our starry Camelopardalis is equally a picture of grace.

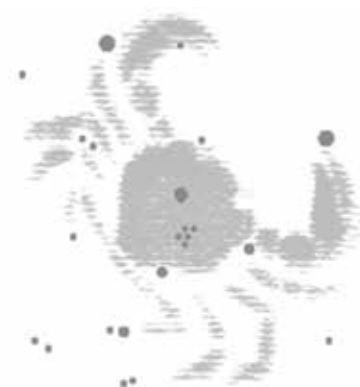


The constellation of Cancer

CANCER

A Crab named Cancer

The Cancer constellation was known at some point as the Tortoise of Babylonia and was represented as such there and in Egypt 4000 B.C. An illuminated astronomical manuscript from the 12th century shows a water beetle. In the Albumasar of 1489 it is a large crayfish, and in the 17th century it was seen as a lobster (Star-Names and their Meanings R.H. Allen).



The sun is in Cancer from middle July to early August; however, the solstice which was formerly here and gave the name to the tropic is now westward near eta Geminorum. It is an ancient constellation with no stars brighter than magnitude 3.5 and regarded as the faintest of the 12 zodiacal constellations. Be that as it may, in a favourable, dark, star-laden night sky the image is outstanding, with the crab's faint little body marked, of course, by the well-known star cluster Messier 44.

In the southern part of the Cancer constellation a very faint planetary nebula, **PK 219.1+31.2**, situated 2 degrees north of the constellation Hydra. Yes, sometimes we do get tired of observing all the faint objects, but in a favourable dark starry-sky it is rewarding to search them out. The planetary, however, is a large see-through glow, making it even more difficult to spot amongst faint stars. What can we expect to see? The sad part is that you have to have a larger telescope, and certainly the darkest star-filled night. Perhaps a double star half a degree south and the very faint galaxy IC 523 situated 20' north-west can show the way.

There is, however, light at the end of the tunnel with a magnificent open cluster further north. Only 1.8 degrees west of alpha Canceri is the open cluster **NGC 2682**, better known as Messier 67. The grouping is beautiful, with a brightness of 5.6, and sits in the shadow of the better-known Crab Cluster further north. The grouping can be seen through small telescopes as a mass of at least 100 stars. With larger telescopes it is a beautiful, rich swarm of various magnitude stars very irregular in shape. On the north-eastern edge an outstanding yellowish magnitude 7.8 star can be seen. Plenty of star strings splash out with a few dark lanes in between. The western side of the cluster contains fewer stars, with a somewhat broken-down impression. However, the cluster contains plenty of yellow-coloured stars, which confirms that it is a very old cluster, more or less 4 billion years old, with a distance around 3000 light-years away and well above the plane of the Milky Way.



NGC 2682 – M67 – Photograph: Dale Liebenberg

Gottfried Koehler was the first to discover M67 before Charles Messier independently rediscovered it in April 1780. But the cluster is famous for a good reason. Robert Zimmerman wrote; to determine the environment in which the birthplace of our sun would be, is like a mote of dust that has been tossed into a pile of dirt. Despite these challenges' astronomers are beginning to pin down a few key facts about the womb that

possibly produced our sun. These parameters are even pointing to the open star cluster M67 as a place where the sun might have been born. Though there are arguments, Bengt Gustafsson of the University of Uppsala Sweden notes the possibility could be appealing.

Astronomers have however found planetary systems of distant stars that in significant respects remind them of the sun's family of planets. One such is the planetary system, 55 Cancri, 41 light-years distant and much like the sun in age and size. It has a newly detected planet that resembles Jupiter in mass and, of greater importance, has an orbit almost the same as that of our planet Jupiter. In the dynamics of the solar system, Jupiter is pivotal in setting up conditions conducive to life on earth. It is not inconceivable; astronomers say that perhaps somewhere between the Jupiter-class planet and the star 55 Cancri orbits an earth-like planet.

The constellation Cancer is mostly popular and best known for the bright cluster **NGC 2632**, also known as the Praesepe or Beehive Cluster, or best to call it Messier 44. The Greek astronomer Hipparchos listed M44 in his second Celestial Catalogue as a little cloud. This cluster can be described in so many ways and is situated between the feet of the crab and made up of several hundred stars, about 500 light-years away. The middle area is relatively dense in starlight in which some double stars stand out. The grouping is best seen using a low-power eyepiece. M44 is probably two distinct clusters colliding with each other, indicating that its core is older than its surrounding members, according to researchers at the University of Leicester England and Queen's University, Belfast. Also discovered is that the Beehive members will fly apart during the next 10 million years or so.

But not only is M44 a famous and well-known cluster; it also hosts a few galaxies (NGC 2624, NGC 2625, NGC 2647, IC 2388, and IC 2390) in its mist.

The late Scott Houston made mention of the Beehive group of galaxies in his Deep Sky Wonders article in the March 1988 issue of the *Sky and Telescope* magazine. He was able to see a few galaxies through a 16-inch telescope, and later in his 25-inch



NGC 2632 – M44 – Photograph: Bob Franke/
APOD-NASA

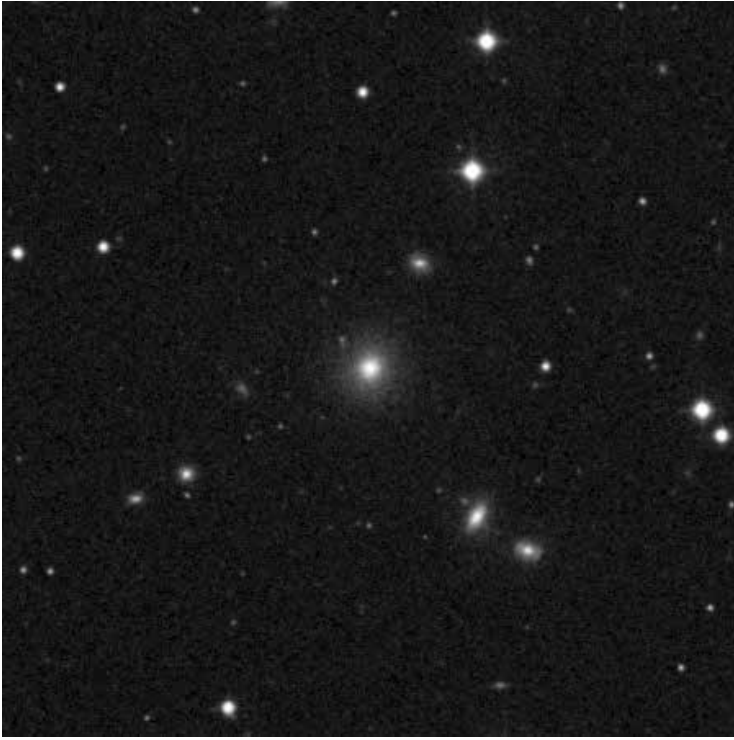
telescope. However, you need a good star map to pin-point the galaxies among the stars of M44. The magnitude 6.2 epsilon Canceri is situated inside and part of the grouping. This bright star cluster is easily seen between delta, gamma, eta and theta Canceri. The stars gamma and delta Canceri are named Asellus borealis and Asellus australis, with delta a Type-K at a distance of 160 light-years and gamma a Type-A at 280 light-years away.

Slightly further west a mass of galaxies can be searched out but be aware: most of them vary from magnitude 12 to 14.5. A close pair, IC 2422 and IC 2423, situated 3.5 degrees east of M44 is three billion light-years away from us and house a pair of super massive black holes at its centres.

A group of seven galaxies in a 40' field of view is to be found east of M44 with **NGC 2749** the brightest. Since galaxies are called faint fuzzies, do not expect to find it without any effort. NGC 2749 is a round haze with a relatively bright core.



NGC 2749 with NGC 2751 towards the south and NGC 2752 north-east, both separate from NGC 2749 by less than 5'. Merging galaxies NGC 2744 and NGC 2744A is at the top right. Photograph: Sloan Sky Survey



NGC 2809 ext. – Photograph: In-The-Sky

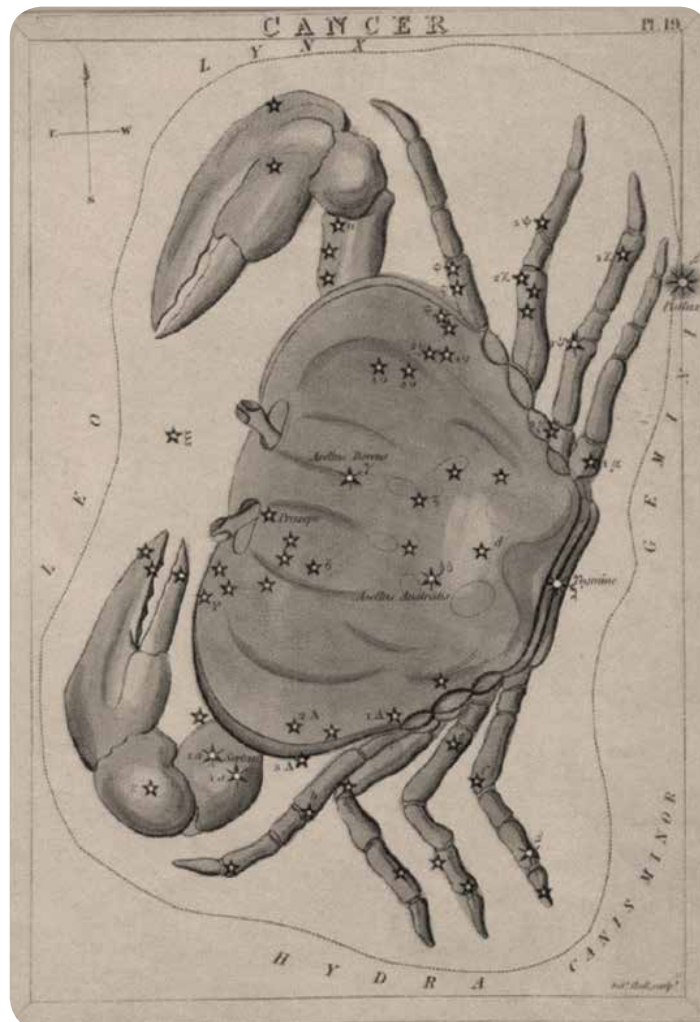
Another very interesting group of galaxies is situated 3 degrees north-east with the dominant elliptical member **NGC 2804**. This cluster of a dozen galaxies is also known as AWM I. In 1977 this group caught the attention of Yerkes Observatory astronomers Elise Albert, Richard White and William Morgan during a search for giant elliptical galaxies that reside outside their usual environment. AWM I, the first entry in a short list of 7 galaxy-groups meeting the necessary criteria.

NGC 2809 is more or less in the heart of the group (middle galaxy in the photograph), with NGC 2807 and NGC 2807A situated only 3' south-west and IC 2457 towards north. John Louis Dreyer logged NGC 2806 as a galaxy in 1876 using Lord Rosse's 72-inch speculum metal reflector while making measurements of stars in the area. However, at the indicated position, is a magnitude 15 star which can be seen just right of NGC 2809 in the picture above.

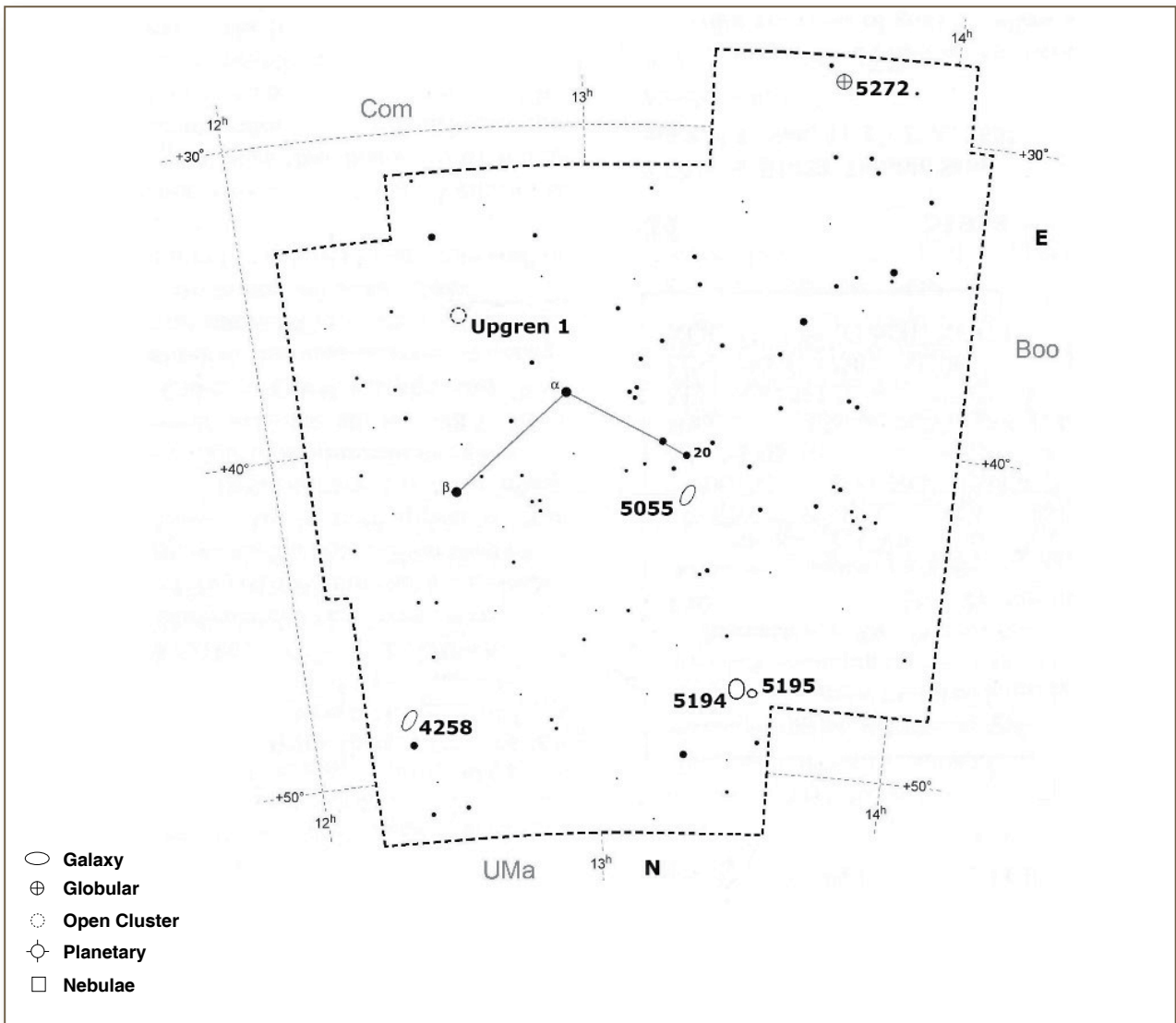
The most northern crab foot, so to speak, is indicated by the magnitude 4 double star iota Canceri. The primary magnitude 4.2 is yellow in colour with the magnitude 6.6 secondary slightly blue. The separation is 3.5" in a position angle (PA) of 307°. It is a colourful pair easily seen in small amateur telescopes. The secondary is also a double star with a Type-KO and Type-AB. Although the pair has magnitudes of 6.6 and 6.5, the separation is only 1.4" in a position angle (PA) 316°.

The crab constellation is surrounded by more galaxies than can be counted, but it stands on its little crab feet to show the observer a thing or two, so don't let the crab scare you.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2632 Messier 44	Open Cluster	08h39m.8	+19°59'.8	3.1	95'
NGC 2682 Messier 67	Open Cluster	08h50m.7	+11°48'.7	5.6	29'
55 Cancri	Star	08h52m.6	+28°19'.8	5.9	*
PK 219.1+31.2	Planetary Nebula	08h54m.2	+08°55'.3	12	950"
NGC 2749	Galaxy	09h05m.4	+18°19'.0	11.8	1.8'×1.7'
NGC 2804	Galaxy	09h16m.8	+20°11'.8	13.6	2.2'×2'
NGC 2809	Galaxy	09h17m.6	+20°04'.7	13.8	1.3'×1.2'



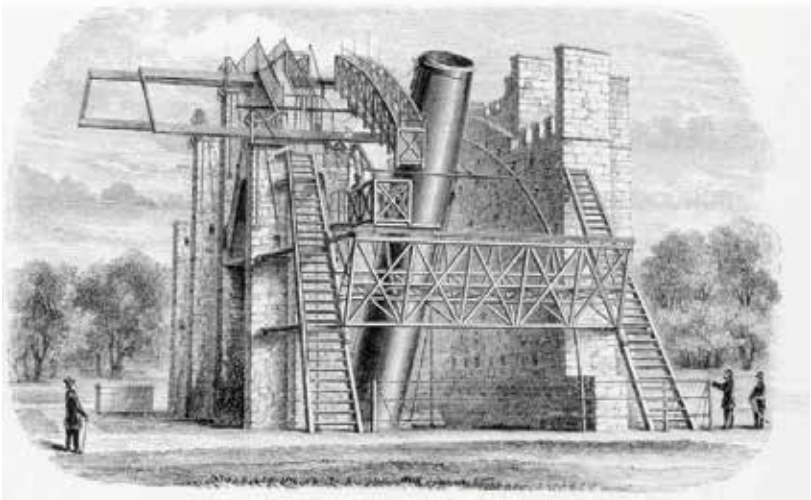
The Uranometria card of 1603



The constellation of Canes Venatici



Lord William Parsons Rosse,
third Earl of Rosse



72-inch Leviathan telescope at
Parsonstown, Ireland

CANES VENATICI

Two Similar Dogs

Studying and appreciating the northern night skies can sometimes be difficult for those of us living in the southern hemisphere. Nevertheless, it is important to describe a few of the northern constellations, since they are home to some of the most interesting objects known.

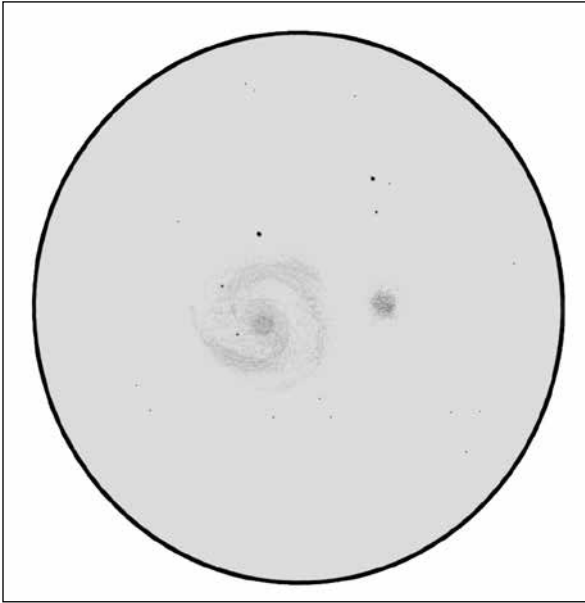


The so-called hunting dogs, in other words the constellation Canes Venatici is situated south of the great Ursa Major constellation. The constellation was first recorded in the 16th century, and Hevelius brought it more into context during the 17th century. The magnitude 2.9 alpha Canum Venaticorum was named Cor Caroli (Heart of Charles) by Halley in honour of King Charles I of England. The star is 120 light-years distant and is a binary pair with a separation of 19.4" and position angle (PA) of 230°.

The galaxies in this constellation probably has the largest spectrum in terms of shapes and character. This brings to mind the galaxy NGC 4449, which is rectangular in shape with distorted arms. The large edge-on galaxy NGC 4244 holds a secret in that if deep sky pictures are studied, one can see a break on both sides of the nucleus and faint irregular hazy knots on the tapered tips. And then the galaxy NGC 4490 has a teardrop shape. A pair of galaxies NGC 5394 and NGC 5395 appears to be in a spiral dance with each other.

A bunch of galaxies near the border with Ursa Major has within its mists surely one of the most delicate galaxies ever observed. The well-known **NGC 4258** is better known as Messier 106. The bright nucleus is well concentrated with a slight halo around it. Large telescopes reveal two tight spiral arms north-east and south-west, which give it an elegant, smooth look. The galaxy M106 is a whole 35 000 million light-years distant with a radioactive source.

But the best-known galaxy pair situated in the far north-east of the constellation is certainly **NGC 5194** and **NGC 5195**, better known as Messier 51. The large open spiral with its companion galaxy, appear as two misty magnitude 8 clouds clearly displaying two bright nuclei. Charles Messier discovered this beautiful object in 1773. Its spiral structure was discovered by Lord William Parsons Rosse (1800–1867) only much later, in 1845, when he observed it using his 72-inch Leviathan telescope at Parsons town in Birr, Ireland. In the 1920s they were recognized as spiral galaxies comparable to our own galaxy.



NGC 5194 and NGC 5195 – Galaxies

A closer look at the large spiral brings to view the two misty arms standing out against the dark dust sections between them. With some care, one can spot a few bright hazy patches and faint stars on the surface. NGC 5194 is one of the finest examples of a face-on galaxy and is popularly referred to as the Whirlpool Galaxy. NGC 5195 the companion, displays an oval shape with a bright outstanding nucleus. However, NGC 5194 rated brighter appears slightly fainter than the smaller satellite companion. Three much fainter companion galaxies are situated further east.



Lord Rosse's book with his Whirlpool sketch in the display case at Parsons town in Birr, Ireland. Photographs: Tim Cooper



NGC 5055 – M63
Photograph: APOD-NASA

The constellation is the proud proprietor of a stream of galaxies belonging to the Local Super Cluster of Galaxies more than 50 million light-years away. Another striking member is **NGC 5055**, better known as Messier 63, which is situated 1.5 degrees north of 20 Canum Venaticorum. M63 is also a large open spiral, slightly tilted towards our view. Reminding the viewer of a beautiful open flower, it is aptly named the Sunflower Galaxy. M63

has a large, bright nucleus surrounded by tightly wound spiral arms that appear as a misty envelope around the nucleus.

Enjoy the open cluster named **UPGREN 1**, an outstanding group of a few bright stars, which seems to be trying to hold its own in galaxy world. Data suggest a much larger extension of stars for up to 37' in size. The brightest star in this grouping is HD 109530, which is situated on the extreme northern side. Arthur Upgren and Vera Rubin have suggested that a small group of bright Type-F stars, moving in the direction of the galactic North Pole, may be the remnant of an old cluster. Utilising the multichannel astrometric photometer (MAP) the authors have determined the parallaxes of six of the candidate stars with an average precision of 1.1 thousandths of an arc-second (1.1mas). The derived distances are, as suggested, similar, and an unusual space density of Type-F stars seems indicated. However, the derived space velocities indicate that the proposed cluster is composed of members of two dynamically different groups (SAO/NASA Astrophysics).

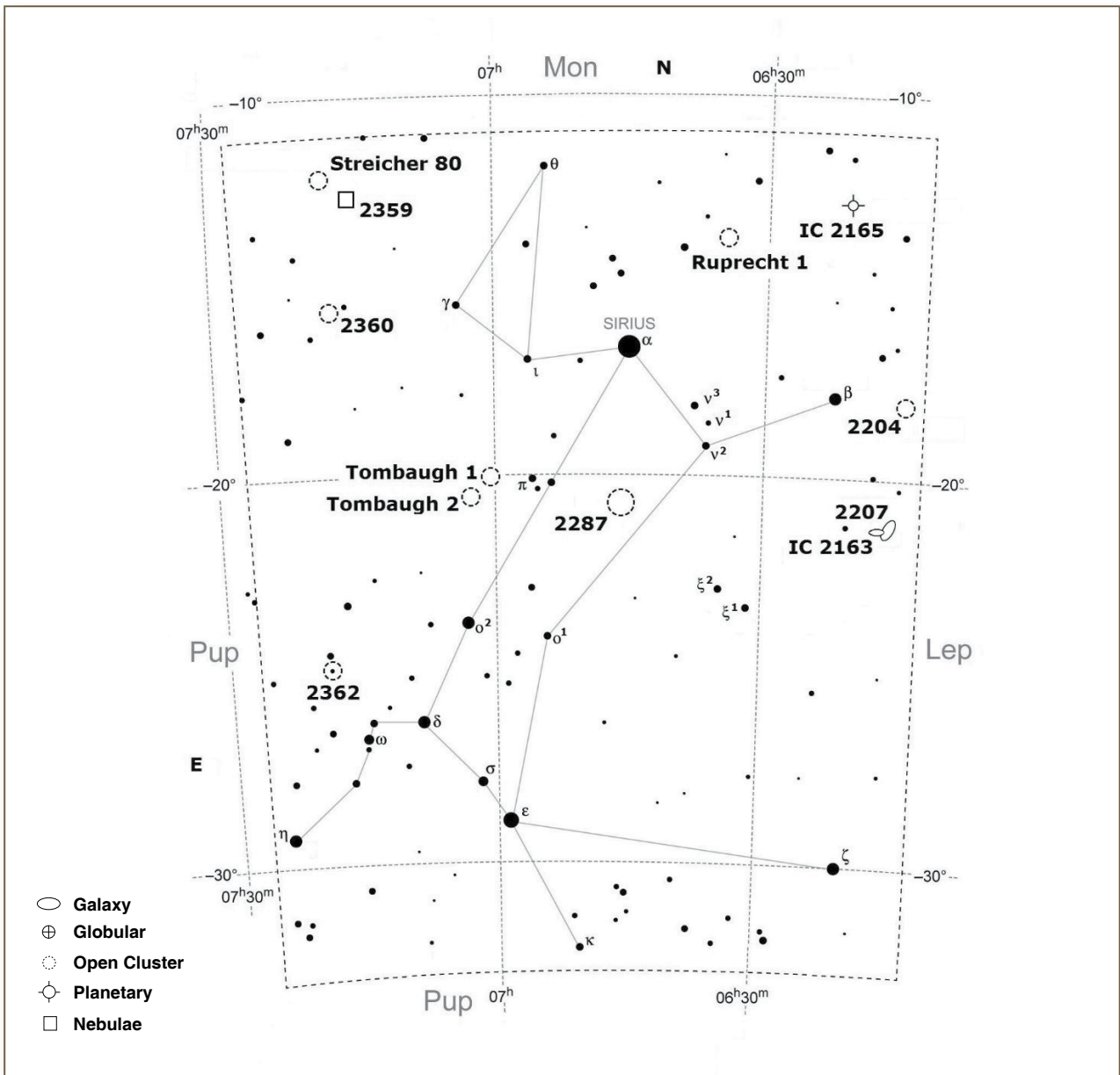
One of the brightest globular clusters in the northern skies is **NGC 5272** or Messier 3. It is a splendid object, large, bright and outstanding against the star field. M3 displays a compact, bright, unresolved core with starlight that blazes off from the core with outliers and pinpoint stars that scattered around the flimsy edges. The south-western side of the globular cluster is busier, with a triple star on the south-east, along with a magnitude 8 yellow star south that keeps coming back with observation to claim its place.



NGC 5272 – M3
Photograph: Adam Block

Understand the precious beauty of the night sky, grasp it near and far.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 4258 Messier 106	Galaxy	12h19m.1	+47°18'.0	8.4	18.6'×7.4'
UPGREN 1	Open Cluster	12h35m.0	+36°22'.6	6.3	15'
NGC 5055 Messier 63	Galaxy	13h15m.8	+42°02'.0	8.6	11.6'×7.3'
NGC 5194 NGC 5195 Messier 51	Galaxy Galaxy	13h29m.9 13h30m.0	+47°12'.0 +47°16'.0	8.4 9.6	10.8'×6.9' 6.4'×4.6'
NGC 5272 Messier 3	Globular Cluster	13h42m.2	+28°23'.1	5.9	16.2'



The constellation of Canis Major



In Memory of Snoekie and Snippie

CANIS MAJOR

Orion's Trusty Hunting Dog

When Canis Major makes its appearance in the east during the southern hemisphere's late summer, I am reminded of the important symbolic role of the dog in ancient times. Centuries ago, the Egyptians painted the dog figure against their monuments and temples as a heavenly symbol. The constellation Canis Major and I have something in common. The same way the Tropic of Capricorn crosses my earthly home, it also cuts a path through the dog constellation.



Canis Major is a well outstanding constellation which has 30 stars brighter than magnitude 5. The starry dog figure is characterised by its bright eye alpha Canis Majoris also known as Sirius or the Dog Star, the brightest star in the sky, as it looks up at its master Orion. Sirius shines unparalleled at magnitude -1.4 with a metal blue-white colour, a mere 8.6 light-years away, twice the mass of the sun and only 250 million years young. The name Sirius comes from the Greek word Seirios which means scorching.

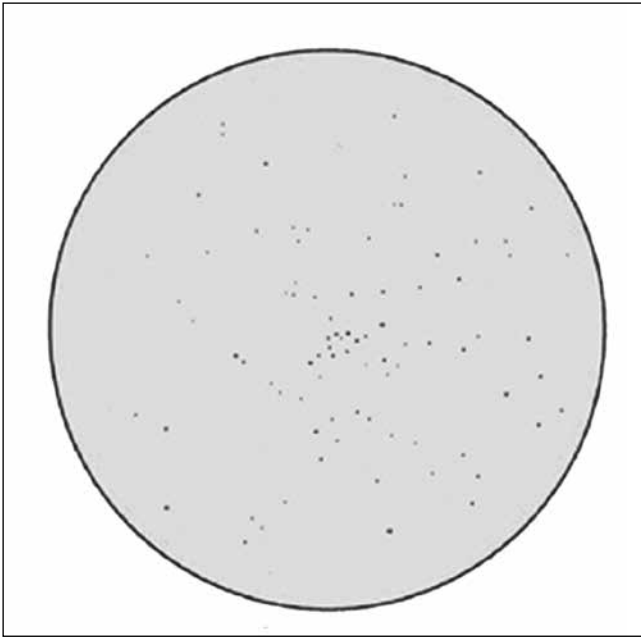


Alvan G. Clark –
Photograph: Wikipedia

Alvan G. Clark discovered Sirius' companion star on 31 January 1862 while testing an 18-inch glass at Cambridge port, Massachusetts. For many years I have been trying to observe Sirius B (a third the mass of Sirius), and would have been satisfied with only a glimpse. The intense concentration, aggravated by the brightness of Sirius, soon causes one's eyes to literally swim with tears. Eventually on good advice from astronomy friend Bruce Dickson, I placed Sirius on the brink of the field of view and could finally appreciate the white dwarf. With a separation of 7" in a position angle (PA) 106° and orbital period of 51.5 years, Sirius B at magnitude 8.5 beckoned me from where the star is hidden between the flashing silver spikes of Sirius. Definitely not an easy observation, in

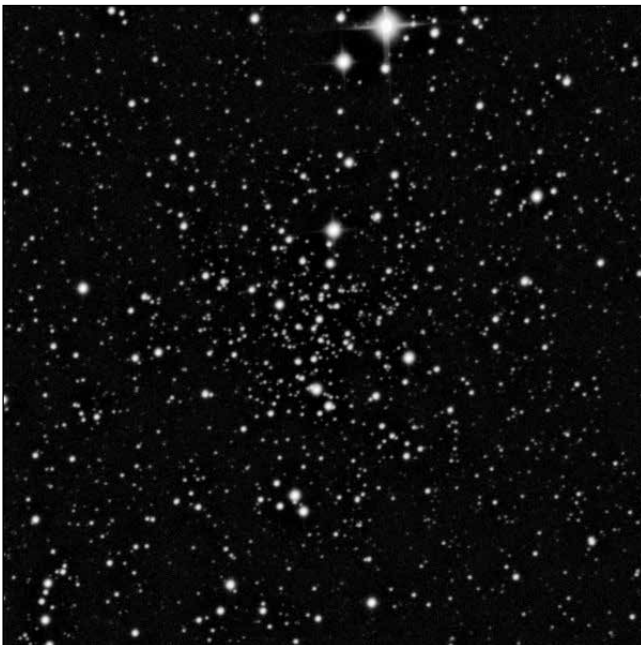
fact, to spot Sirius B is one of the most challenging. Friedrich Wilhelm Bessel already noticed in 1844 that two of the brightest stars in the sky, Sirius and Procyon show slow, periodic position shifts with respect to other stars.

In the far north of the constellation is the planetary nebula **IC 2165**, situated in the north-western corner of the constellation. This object is easy to find and stands out well, seen as an even bluish disc with a smooth surface brightness. With higher magnification, it turns out to be slightly darker towards the centre with a glimpse of a faint magnitude 14.5 centre star. With the use of a nebular filter, its high surface brightness reveals its delicate nebulosity with diffused edges.



RUPRECHT 1 – Open Cluster

The open cluster **RUPRECHT 1** is situated about halfway between Sirius and IC 2165 in a sprinkled star field. Closer investigation shows an arrow shape of faint stars pointing in a south-east direction. Fainter members fill up the space and spray out in a north-west direction giving the impression of ice cream on a cone. There are a handful of Ruprecht clusters that find a home in the constellation Canis Major.



NGC 2204 – Open Cluster
Photograph: phys.ttu.edu

The cluster **NGC 2204** nestles at the right front paw of the starry figure very close to the border with Lepus. The object is 1.8 degrees west of beta Canis Majoris, named "Murzim" that means the announcer, situated west of Sirius and rises before its brilliant neighbour. The relatively small star group is very elongated, flowing from north-east to south-west with mixed magnitude stars. A very small knot of faint stars can be seen toward the middle area before it splashes south into a larger uneven circular haze of faint stars. The northern part of the group is marked with brighter stars, one an exceptional orange magnitude

5.8 member. The galaxy couple NGC 2211 and NGC 2212 take up their stands 44' east of NGC 2204. But be aware, the pair is rather faint.

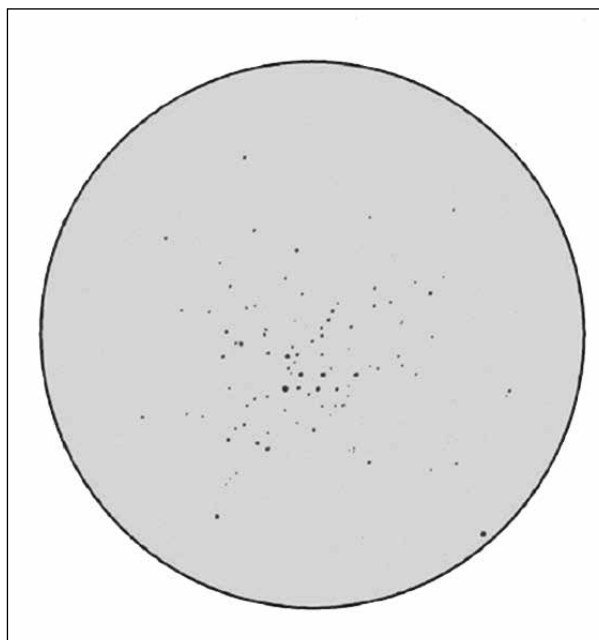
Apparently, an international team of astronomers has discovered a new dwarf galaxy that is being tidally shredded and devoured by our Milky Way. The Canis Major dwarf lies even closer to the galactic centre than any other companion galaxy previously known.

The impressive close pair of galaxies **NGC 2207** and **IC 2163**, is situated further south along the border line with Lepus. I was pleasantly surprised at the amount of detail visible in this unique object. Although rather faint, the two galaxies are surprisingly easy seen. NGC 2207 shows much more detail with a relatively bright nucleus and a flimsy south-west edge. IC 2163 is seen as a small faint haze on the eastern edge of NGC 2207, barely touching it, gravitationally disrupting each other. Sir John Herschel discovered NGC 2207 on the night of 24 January 1835, and he recorded it as rather bright, pretty large, very elongated, and suddenly becoming a little brighter in the middle. He failed to identify IC 2163, which was discovered by Herbert Howe on 11 February 1898 at the Chamberlin Observatory, Denver Colorado.



IC 2163 and NGC 2207 – Galaxies
Photograph: Dieter Willasch

Like a bunch of fleas, **NGC 2287**, also known as Messier 41, takes cover under the belly of the dog figure, 4 degrees south of the star Sirius. This beautiful cluster of approximately 100 stars which can be seen with the naked eye and partly resolved using binoculars is moving away from us at about 34 kilometre per second, 24 light-years across and 2300 light-years distant. This is one of the few deep sky objects to have been recorded in ancient times. It is also one of the night sky's delights with the grouping reminding me of a lovely flower, opening its petals in clear curls and curved lines. Two rusty coloured stars remind me of pollen threads flowing out of a central crown consisting of a semi-circle of brighter members. A swarm of faint stars covers the cluster like dusting powder with a few dark patches in-between.



NGC 2287 – M41 – Open Cluster



Dr. Clyde W. Tombaugh (1907-1997)
 Photograph: The Telegraph

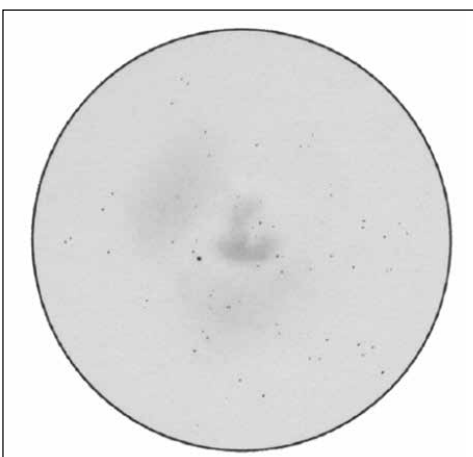
Clyde Tombaugh's planet Pluto (which he discovered in 1930) has been laid to rest, but who knows about his discovery of two clusters in the constellation Canis Major? **TOMBAUGH 1** displays a sort of oval grouping, containing very faint stars, slightly elongated in an east to west direction. A string of faint stars swings out to the east of the barely compact centre. **TOMBAUGH 2** is situated about 40' to the south-east as a much smaller hazy patch with only a few stars resolved.



A small portion of Tombaugh ashes was placed in a container aboard the New Horizons spacecraft now travels to the mysterious Kuiper Belt or Third Zone before eventually leaving the Solar System altogether and taking Clyde Tombaugh's ashes with it.

Photograph: Reddit Kansas

The open cluster **NGC 2362** reveals itself as a roundish haze in low magnification, giving a rather globular cluster impression. NGC 2362 is a beautiful, irregular shaped cluster, with a sparkling mass of mainly blue-white stars. A few members are grouped more to the southern side of the cluster. NGC 2362 is estimated to be only 1 million years old, one of the youngest clusters known, with tau Canis Majoris a possible true member.



NGC 2359 - Diffuse Nebula

NGC 2359 is well-known as Tor's Helmet, also called the Duck Nebula, and situated in the north-eastern corner of the constellation. It is a dim complex of filamentary nebulosity surrounding a Wolf-Rayet star. The northern part is hazy and flimsy in contrast with the southern, more defined part. It appears to be the head and bill of a duck looking sideways. With imagination a magnitude 9 star on the eastern edge could be seen as the duck's eye.

Charles Wolf and Georges Rayet discovered an unusual pattern in the wavelengths of light emitted by certain very hot stars. This type of star loses its outer hydrogen layers late in its evolution.

The asterism **STREICHER 80** consists of a handful of mixed magnitude stars with a surprising broken oval impression. The brightest star magnitude 9.4, HD 58055, is situated towards the northern edge in the field of view. It was a great surprise to discover that one of Clyde Tombaugh's open clusters also appears to have in its midst a sort of oval impression, and on top of this in the same constellation.

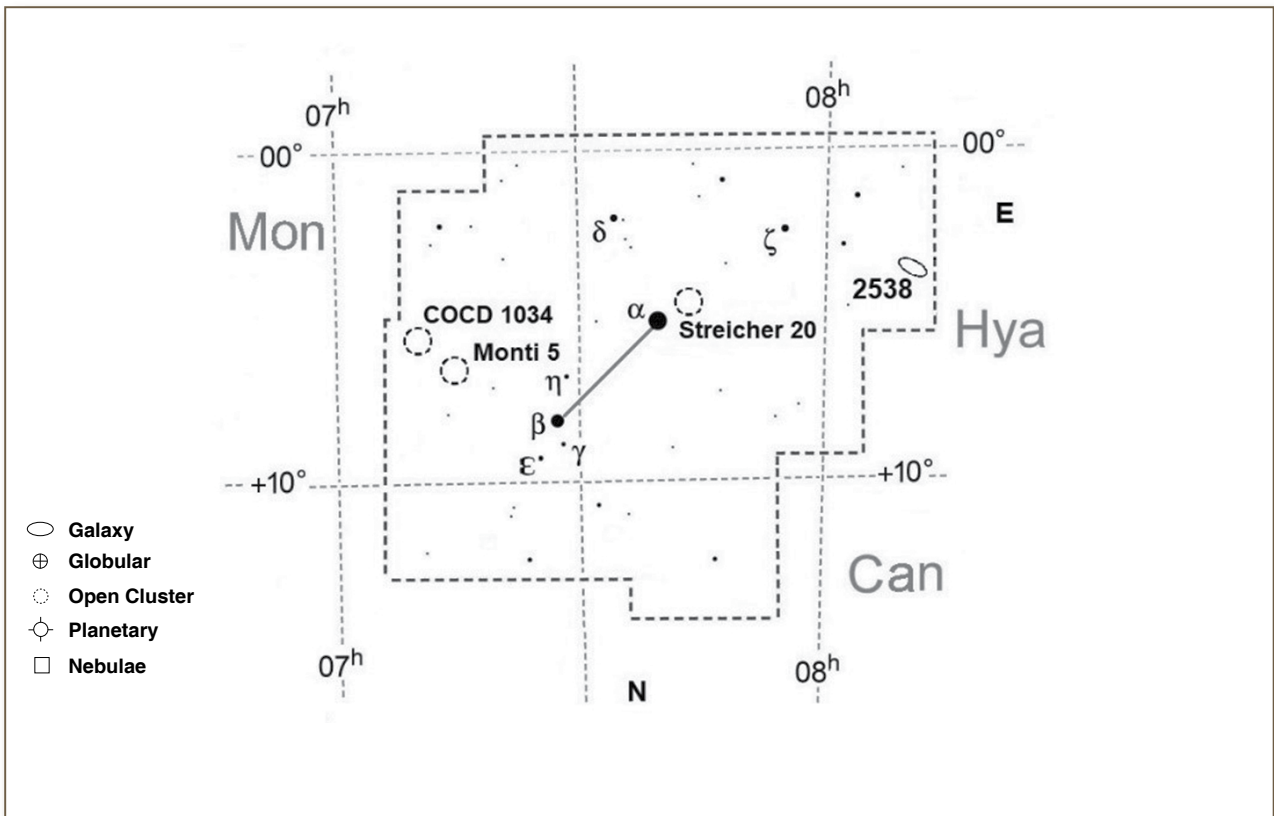


STREICHER 80 – Photograph: DSS

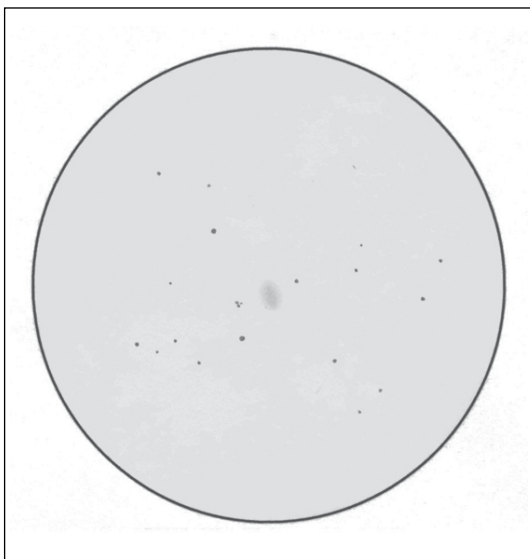
NGC 2360, also known as Caroline's Cluster, is situated just 3 degrees east of gamma Canis Majoris. This lovely grouping is a scattering of faint stars in short and long strings, which are tightly grouped together. The cluster core is well concentrated and outstanding.

It is said that a dog is a man's best friend, so make the starry dog your friend, with the numerous beautiful objects that it unconditionally gives us to enjoy.

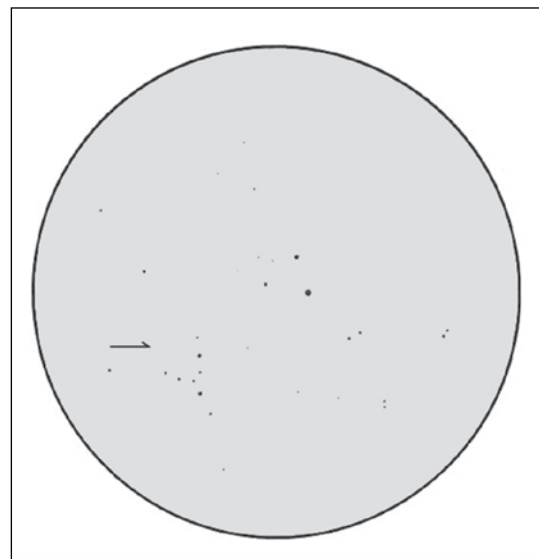
OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2204	Open Cluster	06h15m.7	-18°39'.5	8.6	12'
NGC 2207	Galaxy	06h16m.4	-21°22'.4	10.8	4.8'×2.3'
IC 2163	Galaxy	06h16m.5	-21°22'.6	12.4	3'×1.2'
IC 2165	Planetary Nebula	06h21m.7	-12°59'.3	10.6	4"
RUPRECHT 1	Open Cluster	06h36m.4	-14°09'.0	11	6'
NGC 2287 Messier 41	Open Cluster	06h46m.1	-20°44'.3	4.5	38'
TOMBAUGH 1	Open Cluster	07h00m.4	-20°34'.2	9.3	6'
TOMBAUGH 2	Open Cluster	07h03m.6	-20°49'.1	12.5	3'
NGC 2360	Open Cluster	07h17m.8	-15°37'.7	7.2	12'
NGC 2359	Diffuse Nebula	07h18m.6	-13°12'.7	9	9'×6'
NGC 2362	Open Cluster	07h18m.8	-24°57'.3	4.1	8'
STREICHER 80 HD 58055-group DSH J0723.3-1237	Asterism	07h23m.3	-12°37'.5	9	8.5'



The constellation of Canis Minor



NGC 2538 – Galaxy



STREICHER 20 – Asterism

OBJECT	TYPE	RA	DEC	MAG	SIZE
COCD 1034	Multiple Star group	07h10m.5	+06°04'.2	8	36'
MONTI 5	Asterism	07h18m.4	+06°18'.2	8.5	3.3'
STREICHER 20 DSH J0743.7+0450	Asterism	07h43m.7	+04°50'.2	9	6'
NGC 2538	Galaxy	08h11m.4	+03°37'.0	12.2	1.6'×1.2'

CANIS MINOR

The Little One

Although Canis Minor is the smaller of Orion the Hunter's two dogs it boasts the brilliant beacon star Procyon, more or less in the middle part of the constellation and the eye-impression of this smaller dog figure. Its name means "Before the Dog", because it rises shortly before the Dog Star, Sirius, in the constellation Canis Major.



The star alpha Canis Minoris (Procyon) is seen without any difficulty as the bright yellow-coloured magnitude 0.4 star. There is also a companion star, Procyon B, a magnitude 12.9 white dwarf first seen in 1896 with the 36-inch refractor at Lick Observatory. It had a separation of 5.2" and position angle (PA) of 26°. Procyon B is about 10 magnitudes fainter than alpha Canis Minoris, which makes it almost impossible to spot in the blinding glare of the primary star.

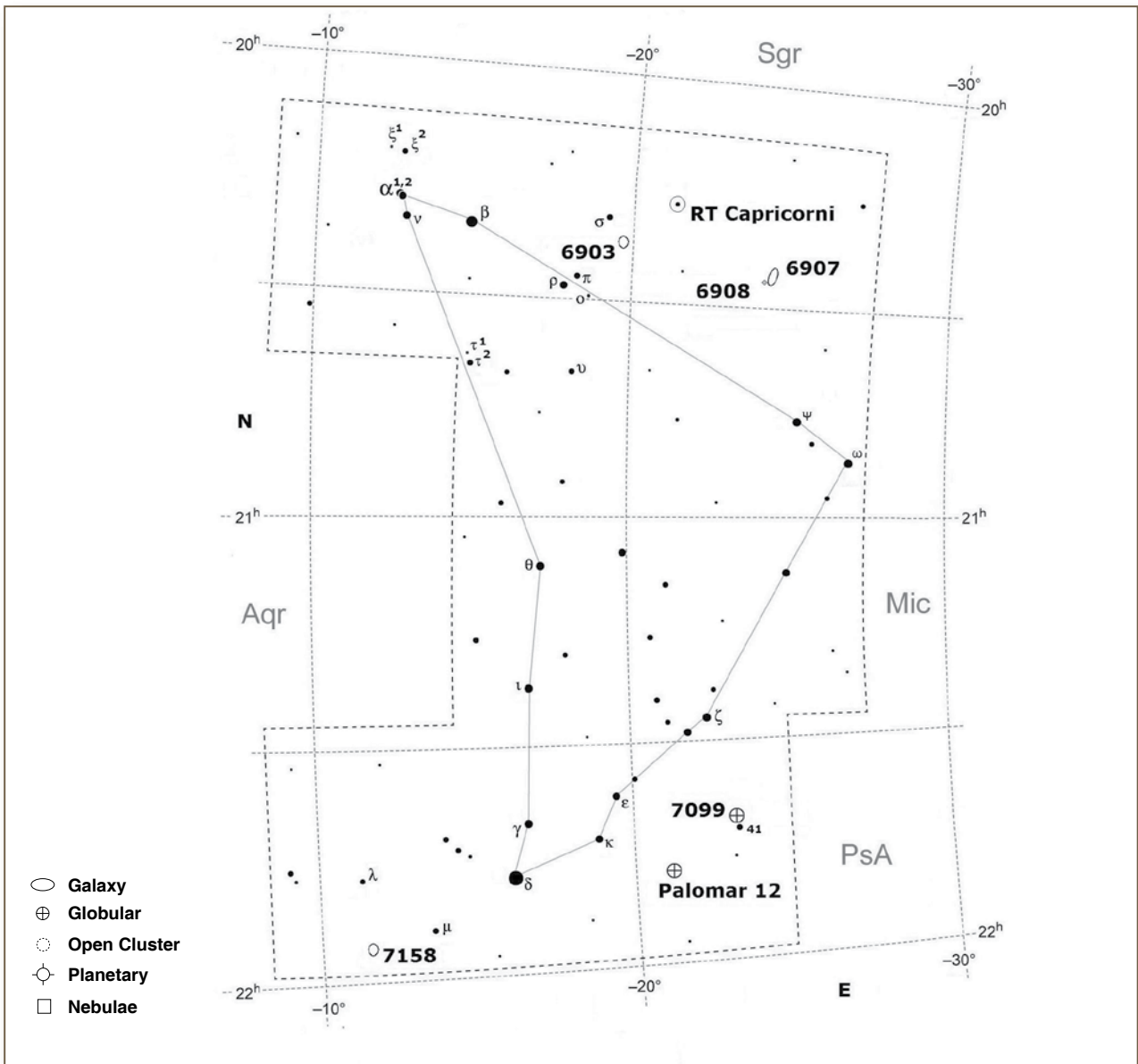
Barely a degree east from this famous star I found an asterism now catalogue as **STREICHER 20**, comprising a handful of magnitude 10 stars in a well-formed flat Y-shape. The open end of the letter Y faces north-east together with three prominently brighter stars that form a wide triangle in the same field of view.

On the western edge of this small constellation is the so-called Triple Trapezium cluster, and each of these three stars had two companion stars as well. Kharchenko, Piskunov and Roeser place most of the stars within the radius of the open cluster **COCD 1034** = ASCC 34 = KPR2005, and list the position of the magnitude 8 star as HD 54779, the brightest member.

However, found a relatively bright six pack, also known as **MONTI 5** just 2 degrees east of COCD 1034. Monti 5 is a tight asterism of stars quite bright and outstanding with the magnitude 8 star HD 56667, on the south-west corner.

To discuss several objects in an article is the norm, but they are not all favourably and easily observed. Galaxies are known to be rather faint most of the time. One such in Canis Minor is the galaxy **NGC 2538**, situated in the far eastern part of the constellation on the boundary with Hydra. The object shows itself only in truly dark skies as a soft washed-out glow slightly elongated north-east to south-west in direction with a faint triple star just east.

Make the good little puppy dog your stargazing friend.



The constellation of Capricornus



The Tropic of Capricorn sign-board along the road, but unfortunately spelled incorrectly

CAPRICORNUS

Celestial Home of Stars

In antiquity the Capricornus constellation was seen as a monster with the head and forelegs of a goat and the posterior of a fish. The creature could almost be compared to the so-called Mermaid but could also sometimes, in the case of Capricornus, refer to the Fishman.

The name 'Tropic of Capricornus' originates from the fact that when first observed towards the east it indicated the point of the winter solstice, this solstice at present being 33 degrees to the west in the figure of Sagittarius.



The constellation is special to me for two good reasons. Not only do I live right inside the old Tropic of Capricornus Circle, but the image also reflects a particular shape: it looks very much like a huge lopsided triangle in the star composition. Heaven alone knows how anyone could see a sea goat with horns in that particular star pattern, but be that as it may ... We will carefully unravel the constellation, which holds a large number of bright stars to please the eye.

The constellation is situated just east of Sagittarius, but sadly it is not rich in deep-sky objects. Still, it is an easily recognisable compilation, with several look-a-like double stars and is, famously, a close neighbour to the centre of the Milky Way.



Monument marking the Tropic of Capricornus

The lovely double star alpha Capricorni, also the star closest to the Sagittarius boundary, is a wide, naked-eye double star. In fact, four companions are listed. Dave Blane indicate that alpha Capricorni is an optical double star with components having magnitudes 4.3 and 3.6 respectively. They have a separation of 381" at a position angle (PA) of 292°. The primary is a Type-G super-giant and the companion a giant star of the same spectral class. Each component is in turn a multiple star, with alpha1 having a magnitude 9.6 companion with a separation of 46.9" at a position angle (PA) of 222°, which is unrelated, while alpha2 has a magnitude 10.5 companion with a separation of 153" at a position angle (PA) of 160°.

Another star, quite extraordinary in its own right, about halfway along the western boundary of the constellation, is RT Capricorni. It is a carbon star which glows with a lovely reddish colour that varies irregularly between magnitude 7 and 11 in 393 days.



NGC 6907 and NGC 6908
Photograph: Dale Liebenberg

Further towards the south-west the galaxy **NGC 6907** displays a misty glow with an elongated shape in a north-east to south-west direction and strongly resembles a miniature Magellanic Cloud. The centre area shows a small star-like nucleus. Higher magnification reveals knotted texture on the surface with a small, barely visible arc-like patch embedded in the north-east listed as **NGC 6908**.

The galaxy **NGC 6903** situated a degree east of sigma Capricorni is easily seen as a roundish glow, quite noticeable against the star field. The galaxy displays a small nucleus which is just slightly brighter. A lovely string of faint stars draws attention towards the eastern part of the star field.



NGC 7158 – Galaxy
Photograph: DSS

An object that was questionably situated in the far northern part is **NGC 7158**, which forms a triangle towards the north-east with the star's magnitude 5 mu and magnitude 5.5 lambda Capricorni. This is one of those objects which was nowhere to be found, but which, on closer investigation, appears as a very faint string of three close stars between magnitude 9 and 11. Steve Coe, using a 13-inch f/5.6, telescope notes it as a triple star in the New Generation Catalogue (NGC 2000). Sure enough, there is a string of three very faint stars at this location. This multiple star system must have been included

in the NGC catalogue because of its nebulous appearance at low power. It is now marked as an extremely faint Seyfert-type galaxy in Uranometria 2000.

The rare globular cluster **PALOMAR 12**, named after the Palomar Observatory, is situated relatively close to the Pisces Austrinus border, and around 60 000 light-years distant. This globular cluster is estimated to be much younger than most of the globular clusters in our Milky Way. Tom Polakis' motion studies suggest that Palomar 12 may have originated in the Sagittarius Dwarf Galaxy, but was probably later captured by the Milky Way.

Capricornus is home to the distinctive globular cluster **NGC 7099**, or Messier 30, which is situated about 3 degrees east of the magnitude 3.7 zeta Capricorni. M30 were discovered by Charles Messier on 3 August 1764 near the star 41 Capricorni. He devoted much of his life to searching the skies for comets and his notes indicate the object to be round, containing no stars and seen with difficulty in a good Gregorian 3.5-foot telescope. With low power it might well resemble a comet, in line with the comment of the Reverend Thomas William Webb.



NGC 7099 – M30 – Photograph: Dale Liebenberg

In Philosophical Transaction 1814, William Herschel described it as a brilliant cluster, the stars of which become gradually more compressed in the middle. John Herschel, son of William, observing with the 18-inch f/3 speculum telescope at the Cape of Good Hope, records the object as; "a globular cluster, bright, 4' long by 3' broad; all resolved into stars, gradually more compressed in the middle. In this accumulation of stars, plainly see the exertion of a central clustering power, which may reside in a central mass."

Vice-admiral William Henry Smyth, an English amateur, was moved to wild speculation about the object. "What an immensity of space is indicated. Such an arrangement is intended as a bungling sputter for a mere appendage to the speck of a world on which we dwell, to soften the darkness."

However, the globular cluster grows gradually brighter towards a tiny, very dense and bright core. Careful observation reveals an image resembling a honeycomb covered with bees. With higher magnification faint stars mingle asterism-like at random, with two prominent strings extending north and north-west, one slightly longer, giving the impression of a pair of firefly antennae. The south-eastern part of the globular is broken down in starlight and in a way cut off by a string of four stars. Also, to be seen is a double star towards the northern field of view. M30 is a large globular cluster that can easily be spotted with binoculars and measures nearly 90 light-years in diameter. It is a very special object – one to remember long after having observed it.



Photograph: Auke Slotegraaf

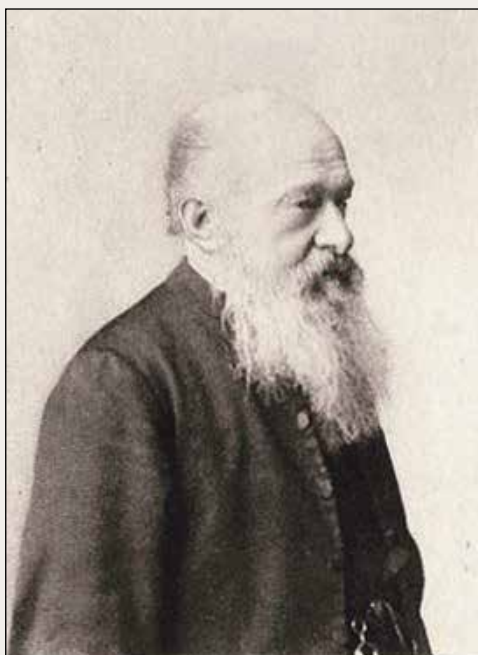
Closer to home, a very realistic observation of my good friend Auke Slotegraaf indicates the position of M30 as lying in south-eastern Capricornus, outside of the large delta-wing shape of the Sea Goat, in the direction of the star Fomalhaut. He further indicates M30's integrated magnitude as $V=6.9$, and it is plainly visible through binoculars as a bright round cometary glow, with a tight nucleus, accompanied by the pale-yellow magnitude 5 star 41 Capricorni. Just 4' west-south-west of the core of the cluster lies a magnitude 8 star. A small telescope shows it as a 3' diameter glow, growing slowly brighter towards the centre, where it becomes suddenly much brighter, forming a definite, strongly condensed, nucleus. The brightest stars in M30 – its red giants – are between magnitude 12 and 13, so a small telescope will show a

few individual stars. Larger telescopes bring the cluster up to about 5' diameter, showing several more cluster members scattered across the background haze of unresolved stars. Two short rows of magnitude 12 stars, leading away from the compact nucleus, catch the eye: one pointing north, the other to the north-west.

M30 is almost 13 gigayears (Gyr) old and has a mass of about 80 000 suns. It lies 26 000 light-years away from our sun and moves in an orbit around our galaxy, which is opposite in direction to the rotation of the galaxy itself. This suggests that M30 was not formed as part of our Milky Way, but was, instead, accreted (gravitationally captured) when its own parent galaxy had a close encounter with our galaxy.

Don't avoid the fish-goat. Grab it by the horns and use them to penetrate the objects within its realm.

OBJECT	TYPE	RA	DEC	MAG	SIZE
RT Capricorni	Carbon Star	20h17m.2	-21°20'0	7-11	*
NGC 6903	Galaxy	20h23m.6	-19°19'6	11.9	2.1'×1.9'
NGC 6907	Galaxy	20h25m.6	-24°49'2	11	3.2'×2.3'
NGC 6908	Nebula	20h25m.8	-24°48'2	15.5	0.5'×0.3'
NGC 7099 Messier 30	Globular Cluster	21h40m.4	-23°10'7	6.9	11'
PALOMAR 12	Globular Cluster	21h46m.6	-21°15'0	11.7	2.9'
NGC 7158	Galaxy	21h56m.6	-11°39'3	10	1.5'



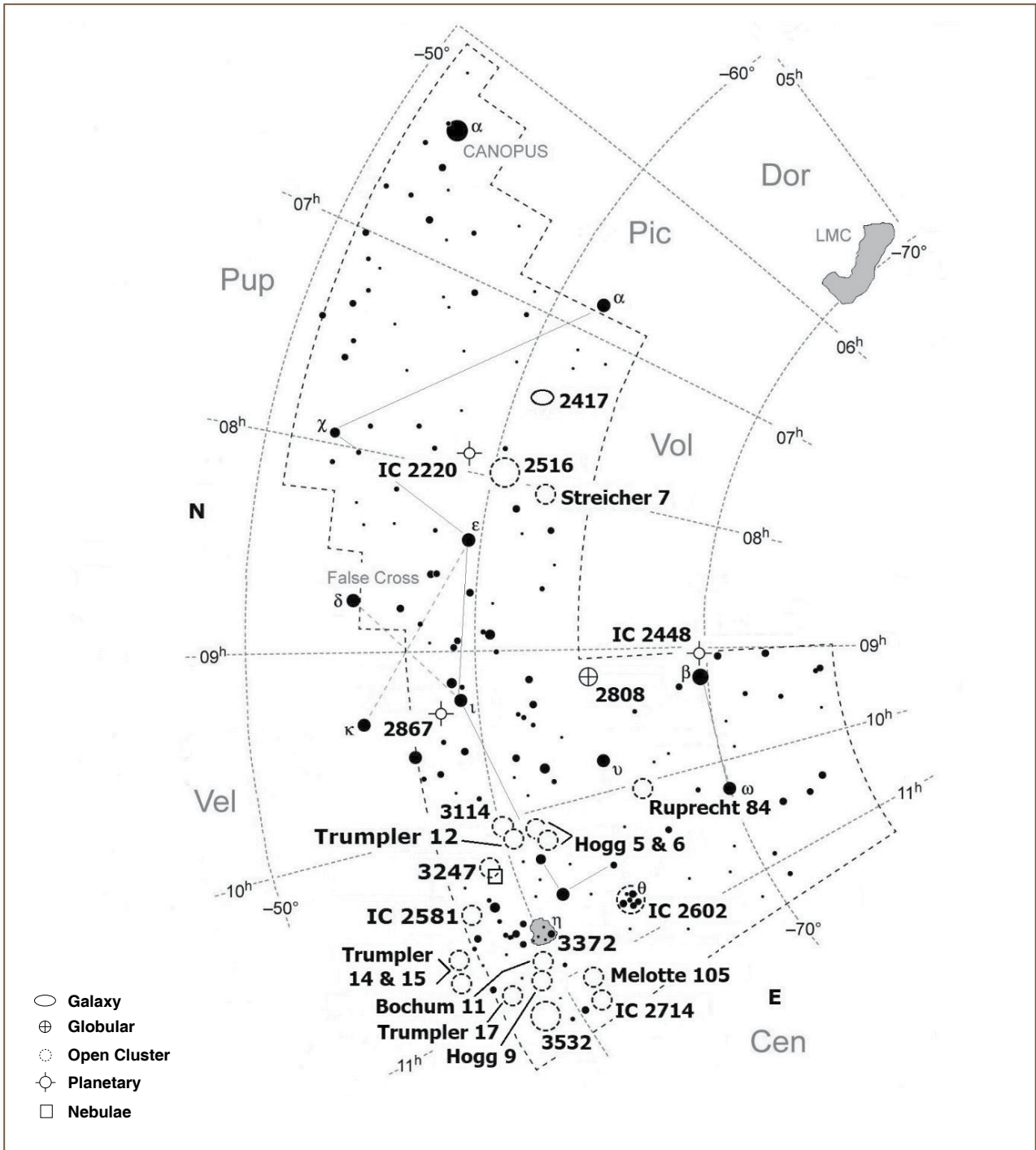
*Your sincerely
T. W. Webb*

Thomas William Webb
Photograph: Webb Society UK

Reverend Thomas William Webb, a British astronomer was born on the 14th December 1806 and died 19 May 1885. He was the only son of a clergyman, and was raised and educated by his father, his mother died while he was still a little child.



Vice-admiral and Mrs Smyth in 1861.
This reproduction is from a lithograph of
an oil painting by E.E. Eddis,
copyright British Museum.



The constellation of Carina

CARINA

Beautiful Carina

When the constellation of Carina makes her appearance in the south-east and at the foot of the constellations Vela and Puppis, she brings with her a sense of deep enchantment. Make use of this opportunity to explore this rich part of the Milky Way – it promises to be a wonderful experience.



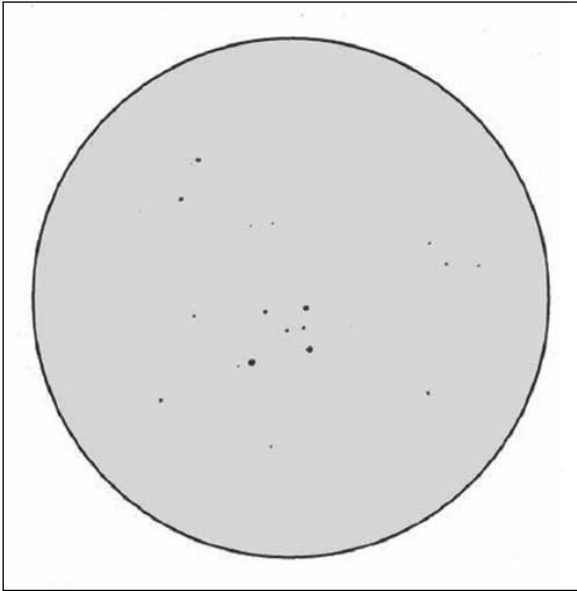
Starting off in the western part of the constellation, the first object to explore is a beautiful planetary nebula. **IC 2220** is situated 3 degrees west of the star epsilon Carinae. The planetary nebula displays a soft, floating haze around the magnitude 12 centre star about 1000 light-years from us. The nebulosity appears slightly brighter towards the western side. IC 2220 was named the Toby Jug Nebula by Paul Murdin, David Allen and David Malin in the Catalogue of the Universe published in 1979.

Barely 1.6 degrees south of IC 2220 is one of Carina's most memorable clusters. **NGC 2516** indicates a beautiful, large, widely spaced, slightly extended north-west to south-east grouping, and a good example of closely associated stars. Bright, individual stars stand out in the busier southern area of the cluster. The entire cluster is richly sprinkled with a variety of different coloured and numerous pairs of stars. A lovely orange coloured magnitude 6.6 star is positioned near the southern extreme with a prominent chain of faint stars extending further southwards. It is an easy naked eye object, indicated as a misty spot to observe in ideal dark skies.

The galaxy **NGC 2417** is situated 3.6 degrees south-west of NGC 2516. This star city displays only a very soft, almost round glow that becomes gradually brighter towards the middle. Using averted vision and high magnification through a telescope, it becomes slightly more defined towards the northern edge.



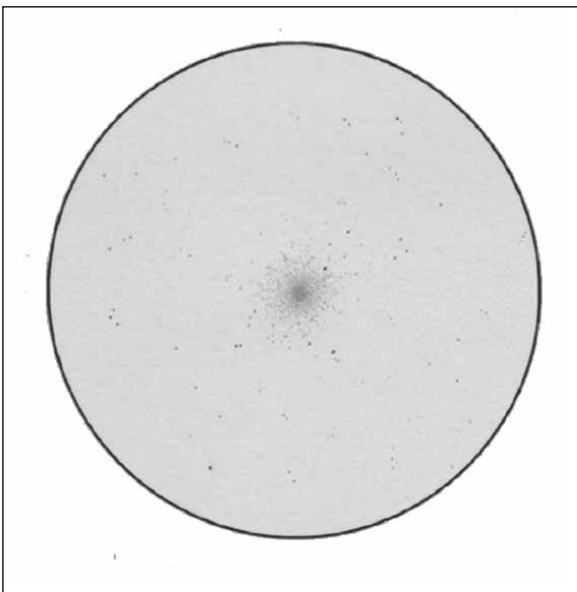
NGC 2417 – Galaxy – Photograph: In-The Sky



STREICHER 7 – Asterism

Situated barely 1.6 degrees south of NGC 2516 is asterism **STREICHER 7**. It is a group of stars that represents a small constellation Crux impression, with the long axis pointing towards the south-east. I am dedicating this asterism to a very special person, Carla (le Roux) Graham. She lost her battle with acute myeloid leukaemia in 2010, and my sincere wish is that the stars in this cross may shine brightly in thought of her memory and the legacy she left behind.

The planetary nebula **IC 2448** is situated only 35' to the west of the star beta Carinae, virtually on the border with Volans. This almost round nebula has an icy-blue colour, and brightens considerably towards the centre, standing out beautifully against the starry background. The star field toward the north of the planetary nebula contains a nice half circle of stars.

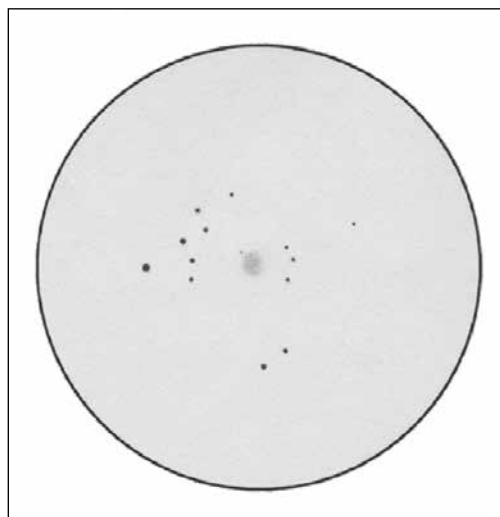


NGC 2808 – Globular Cluster

Globular cluster **NGC 2808** is situated relatively in the middle of the constellation Carina and is a must observe for amateurs. Also known as Bennett 41, it is remarkably large and round in shape with a steady brightening towards a dense pin-point core. This uniformly mottled snowball reveals bright individual stars radiating slightly away outwards. Higher magnification through a telescope reveals the nucleus submerged in a bath of faint stars, with an outer ring that appears misty and rough. In the outer region, prominent chains of stars are noticeable, with vacant gaps of starless patches.

Brighter stragglers populate the southern side of the star field. The object is easily visible through binoculars.

A degree north from iota Carinae is the planetary nebula **NGC 2867**, showing a sort of round face with a woollen appearance on its outer edge and a frosted blue colour. To my surprise the extremely faint magnitude 13.7 star on the planetary north-eastern edge is easily visible. The planetary nebula stands out beautifully against the background star field.

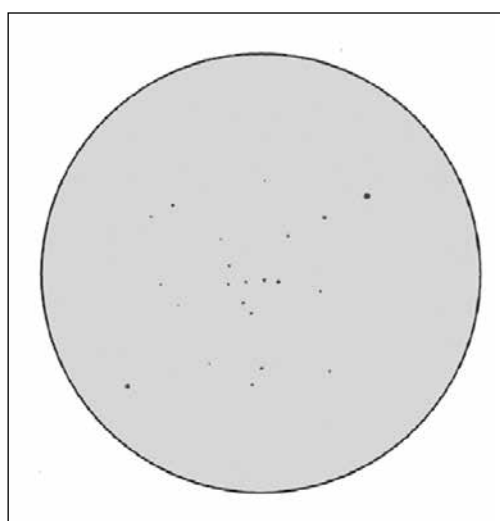


NGC 2867 – Planetary Nebula

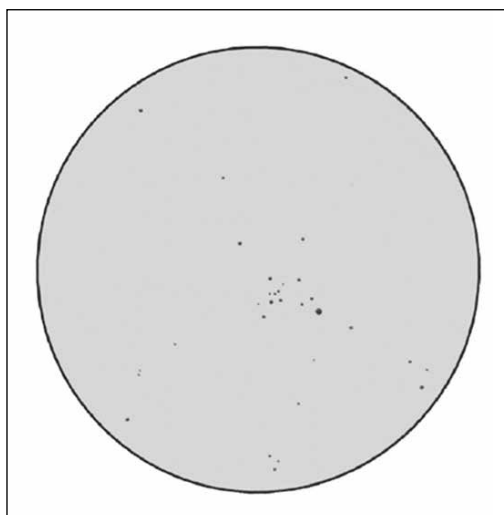
RUPRECHT 84 displays a small stringy grouping situated only 15' south-east of upsilon Carinae in a bare star field.

Towards the end of 1963, the Czech astronomer Jaroslav Ruprecht travelled up the slope of Mount Aragats, an extinct volcano in northern Armenia. Ruprecht was carrying out a mission for the International Astronomical Union (IAU) on his way to the Byurakan Astrophysical Observatory, the Soviet Union's greatest observatory. There he studied the detailed list of young hot stars and open clusters compiled more than a decade before at the observatory.

Ruprecht was the ideal person to gather the information because he was a leading expert and one of the main compilers of the 1958 Catalogue of Star Clusters and Associations.



RUPRECHT 84 – Open Cluster



TRUMPLER 12 – Open Cluster

TRUMPLER 12 is an attractive open cluster with its 12 splinters of starlight. The stars form a small compact grouping with a magnitude 8 star on its western edge.

HOGG 5 and **HOGG 6**, which may be part of Trumpler 12, can be seen 5' and 10' to the south respectively. Hogg 5 is visible as three prominent stars in the company of a few faint members. Hogg 6 is situated in-between a visible wide double star as a very small grouping.



NGC 3114 – Photograph: Dale Liebenberg

ancient 110 million years old. Under ideal dark skies it can be glimpsed with the naked eye.

NGC 3114 was one of the first memorable objects I studied in this fairy tale constellation. To find the cluster is easy enough. Start with the two most eastern stars of the False Cross, magnitude 2.2 iota Carinae and magnitude 2.4 kappa Velorum. From iota Carinae it is situated almost 6 degrees east, halfway to the Carina Nebula (eta Carinae). NGC 3114 is a large, bright cluster, its stars haphazardly dispersed, with a range of magnitudes. The group is believed to be an amazingly

ancient 110 million years old. Under ideal dark skies it can be glimpsed with the naked eye.



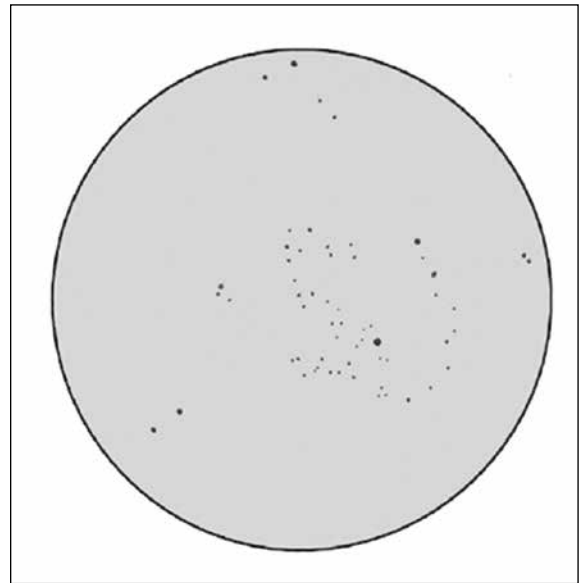
NGC 3247 – Photograph: In-The-Sky

The misty open star cluster **NGC 3247** situated further north is known by many other names, like Cr 220, We 2, vdB-Ha 95 and ESO 127-SC18. What makes the cluster exceptional is the nebulosity permeating and enveloping it. NGC 3247 is not exceptionally bright, but it evokes a feeling of mystery because of its many facets. John Herschel indicated that the cluster displays a knot of around 25 shiny pin-point stars with a nebulous patch to the south-east, and he referred to the cluster as NGC 3247. When Per Collinder (1890-1974), the Swedish astronomer found

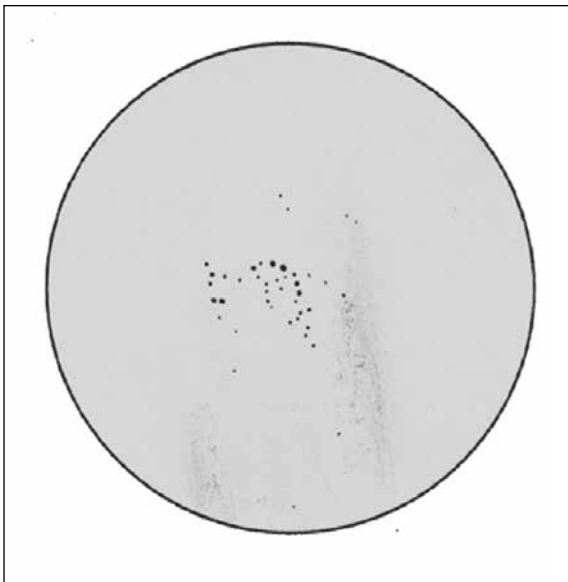
an object 20' south-east of the indicated NGC 3247 position, he thought he had discovered a new object, which he named Cr 220. Obviously, Herschel had indicated the wrong position for the cluster, but there is no doubt that he was referring to the correct object. Catalogues now refer to the indicated correct name of the cluster as NGC 3247 along with others. Brian Skiff an astronomer at Lowell Observatory first noted the confusion regarding this cluster. The group of stars are arranged in a slightly elongated north-west to south-east direction. The nebula appears as a kidney shape folding its flimsy arms around the tight cluster. The soft, uneven cloud is situated towards the south-east of the group, much larger, fading out into the star field.

Slightly north of the Carina Nebula an exquisite bundle of stars takes up prime residence. The stars in **IC 2581** spiral out in streams from the prominent magnitude 4.6 star, with the bulk of the members situated towards the north.

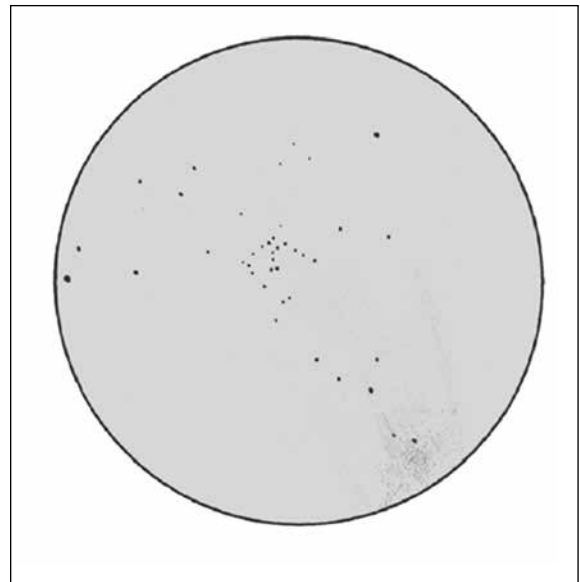
Make sure to stop at the magnitude 3 epsilon Carinae, which is a lovely double star. The magnitude 3.1 primary is a yellow sun, in comparison with its fainter magnitude 6.1 companion, which displays a yellow-white hue. The two components, with a separation of 5", are currently in a position angle (PA) of 127°.



IC 2581 – Open Cluster



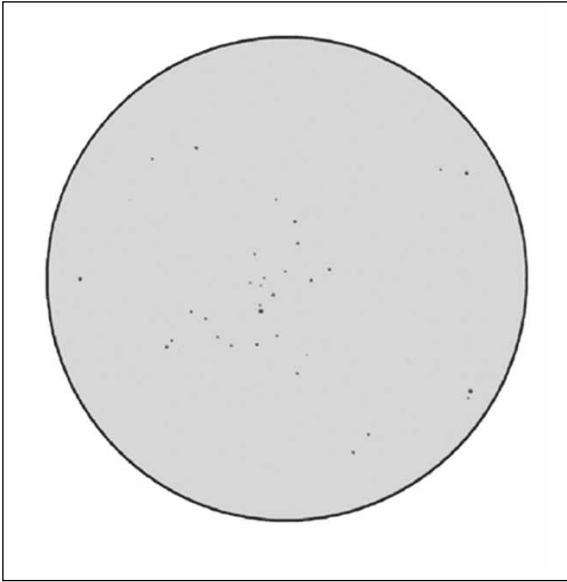
TRUMPLER 14 – Open Cluster



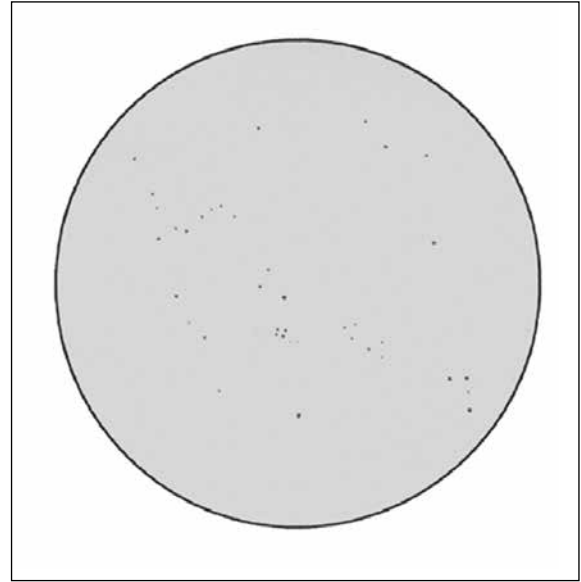
TRUMPLER 15 – Open Cluster

I just love the cluster **TRUMPLER 14** embedded like an embryo in the north-west flimsy arms of the Carina Nebula. Its faint stars appear in curly strings intertwined with one another. The northern part seems to be brighter with a half-moon shape protecting the faint inner group of stars which extends into the southern part of the cluster. Towards the eastern end of the group a double star stakes a prominent place giving this dainty little cluster an elongated east-west impression.

In the northern outskirts of the Carina Nebula, **TRUMPLER 15** displays a stringy group with stars in close formation. Faint nebulosity can be seen towards the southern field of view. This group is believed to be about 6000 years old.



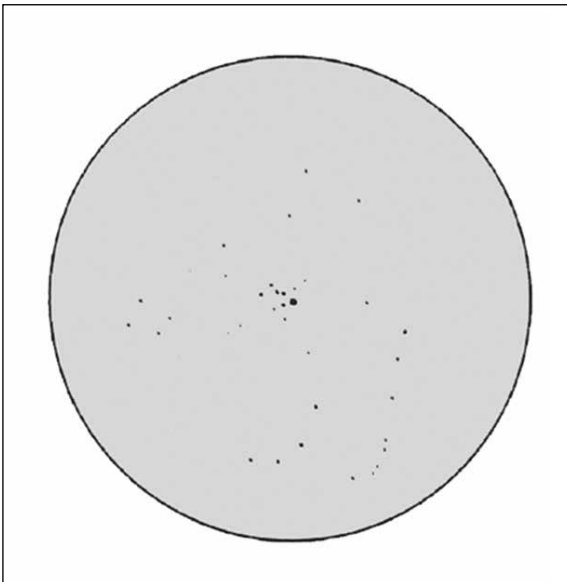
TRUMPLER 17



HOGG 9

TRUMPLER 17 is situated barely a degree east of the Carina Nebula. It is an exquisite grouping of approximately 25 stars that circle out to the south-east from a pair of stars. The bulk of the stars appear in an M-or-W shape.

Closer to the Carina Nebula **HOGG 9** is exceptional in composition, representing a tight square compiled by four faint stars with outstanding beauty that stands out well against the busy star field. The grouping was discovered by Australian born Arthur Robert Hogg.



BOCHUM 11 – Open Cluster

Another lovely group, **BOCHUM 11** is situated in the south-eastern membranes of the Carina Nebula, displaying only a few faint stars. It proves to be a delight to the keen eye. Anthony Moffat and Nikolaus Vogt compiled a list in 1970 labelled Bochum Clusters, after the Bochum Ruhr-University in Germany.

The constellation Carina is a veritable playground of open star clusters, and it is easy just to lose yourself in the variety on offer in this opulent part of the Milky Way.

NGC 3532 was discovered by Nicolas Louis de Lacaille while he was visiting the Cape of Good Hope. He noted quite a number of faint stars in the cluster; while John Herschel indicated it as a brilliant object. This beautiful star cluster is something really special and boasts a location as a near neighbour to the mighty Carina Nebula around 3 degrees north-east and also situated in the same wide binocular field of view. NGC 3532 is an obvious hazy spot to the naked eye, only 1200 light-years distant. The cluster is very rich in starlight, and hosts more than 600 true members. NGC 3532 is obviously elongated in an east-west direction and spans nearly a degree in size. The middle part of the cluster displays a slightly denser area. It's large displays of star strings appear almost like a spiral with open patches in between. This grouping, nicknamed the Arrowhead Cluster, is in one word simply just beautiful.

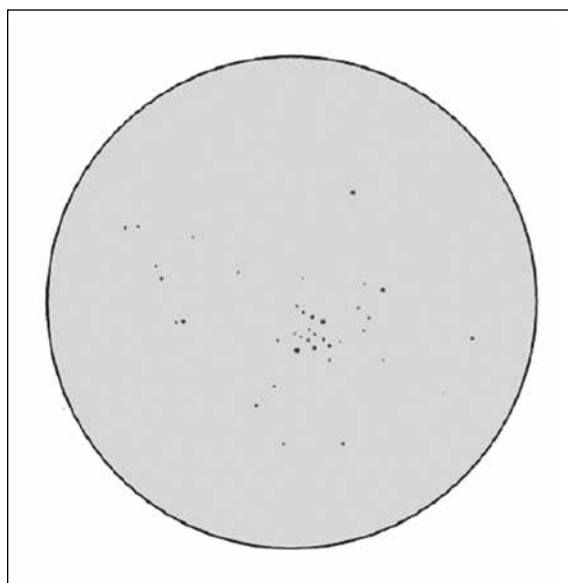


NGC 3532 – Open Cluster
Photograph: Dale Liebenberg

IC 2714 is a special cluster, and is situated in the far north-east of the constellation. In his charming Dutch-Afrikaans the late Albert Jansen introduced me to this pile of stars. The cluster reminded me of a street-light on a wet, misty evening. The group appears quite roundish in shape with a scattering of faint stars. This was James Dunlop's first discovery in 1826.

The cluster **MELOTTE 105** is situated just 50' north-west from IC 2714. The brighter stars in this cluster, shaped in a sort of a fancy letter M on a bed of fainter stars could well be indicative of Mr. Melotte who discovered this group.

British astronomer Philibert Jacques Melotte (1880–1961) also discovered Jupiter's moon Pasiphaë, 676 Melitta, and the famous cluster Mel 111 in the constellation Coma Berenices. Melotte was awarded the Jackson-Gwilt Medal of the Royal Astronomical Society in 1909.



MELOTTE 105 – Open Cluster

The exceptionally rich great Carina Nebula, also known as **NGC 3372** is a famous landmark of the southern skies and is a treasure trove for the naked eye. Sir John Herschel sketched the eta Carinae Nebula around 1834. He drew the dark inner portion of the nebula, known as the Keyhole, much more definitely than it appears today; an indication that this part of the nebula has changed. The star eta Carinae on the eastern rim of the Keyhole nebula shows two soft lobes embedded in haziness. The little nebula around the star eta Carinae is called the Homunculus, meaning "manikin", and is expanding at 5000 kilometres per second away from the star. Since 2001 studying it through my telescope, I have been noting the two soft lobes around the star with the south-eastern lobe slightly larger and brighter. Follow-up observations indicate two prominent dark markings imbedded, one a tad bigger than the other. A surprise was the two small dents, or notches in the larger lobe's north-east peripheral rim. Ideal dark skies and high magnification show a faintly visible flare between the two lobes. Observers with larger telescopes capable of high magnification should explore this star and its nebula, which pumps out as much energy in six seconds as our sun does in an entire year.



NGC 3372 – eta Carinae Nebula



NGC 3372 – eta Carinae Nebula – Photograph: Doug Shape

IC 2602 is arranged around the star theta Carinae, situated in the eastern part of the constellation and also known as the Southern Pleiades. This open cluster is a whopping 100' wide with a total visual magnitude of 1.9. The deep blue colour of the star theta Carinae near the centre calls to mind the similarly placed star Alcyone



IC 2602 – Photograph: phys.ttu.edu

in the well-known bright naked eye group of stars called the Pleiades in the northern constellation Taurus.

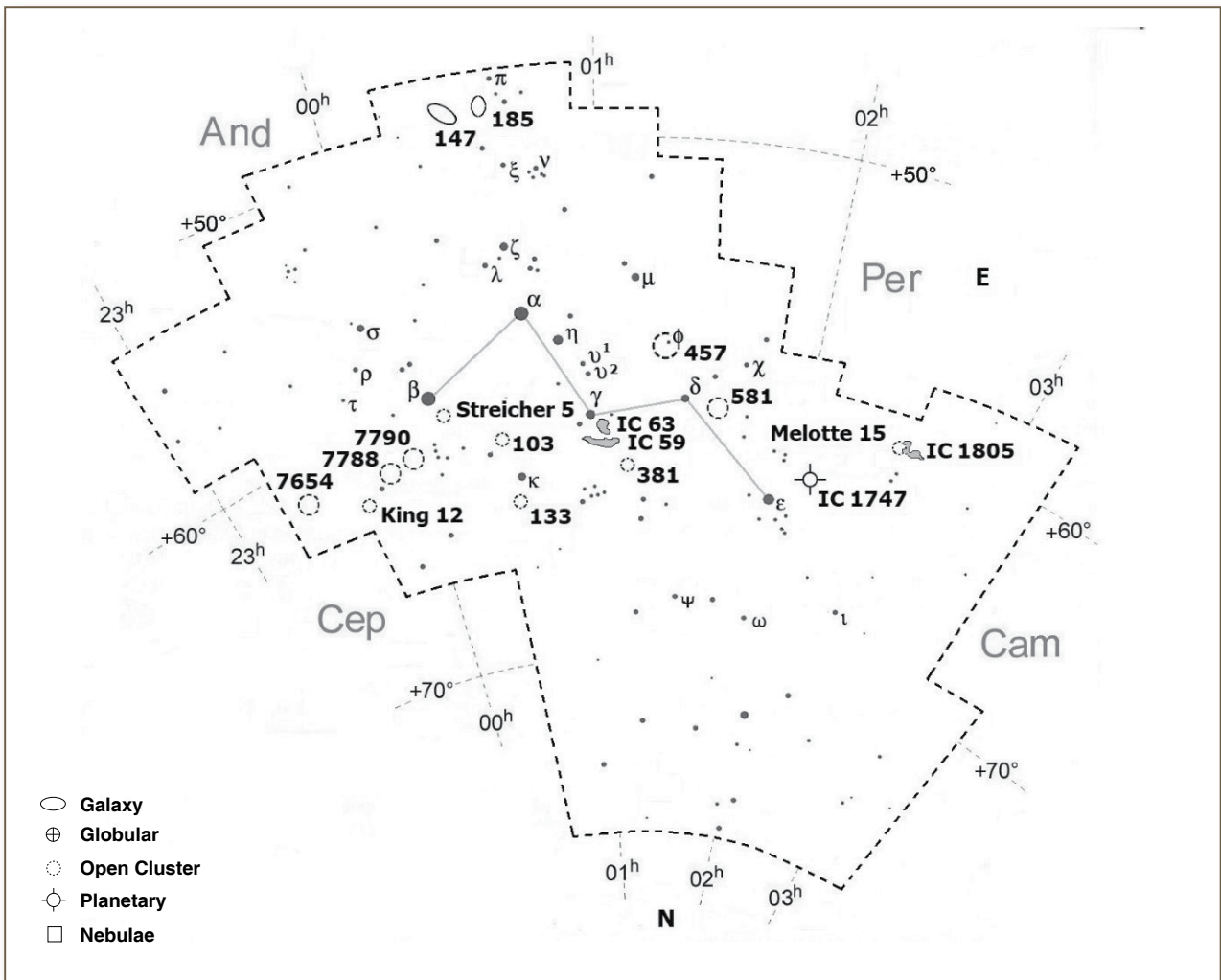


Robert Julius Trumpler – Pencil Sketch: Kathryn van Schalkwyk
Original photograph: Astronomical Society of the Pacific

Robert Julius Trumpler (1886–1956) was a Swiss-American astronomer who discovered that the brightness of individual distant open clusters was lower than expected. He studied and catalogued the dimensions of open clusters in order to determine the size of the Milky Way. He also showed the existence of interstellar dust.

To be a star lover is a given; to explore the beautiful Carina constellation is a huge privilege; and in the Southern Hemisphere's dark of night we all shine to our full extent.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2417	Galaxy	07h30m.1	-62°15'.2	12.4	2.6'×2'
STREICHER 7 DSH J0753.6-6220	Asterism	07h53m.6	-62°20'.9	4	6'
IC 2220	Planetary Nebula	07h56m.8	-59°08'.0	7	5'×5'
NGC 2516	Open Cluster	07h58m.3	-60°52'.2	3.8	28'
IC 2448	Planetary Nebula	09h07m.1	-69°56'.5	11.5	8"
NGC 2808	Globular Cluster	09h12m.0	-64°52'.0	6.1	13.8'
NGC 2867	Planetary Nebula	09h21m.4	-58°19'.0	9.7	11"
RUPRECHT 84	Open Cluster	09h49m.2	-65°15'.1	11	3.6'
NGC 3114	Open Cluster	10h02m.7	-60°07'.0	4.2	35'
TRUMPLER 12	Open Cluster	10h06m.4	-60°19'.2	8.8	4'
HOGG 5	Open Cluster	10h06m.5	-60°23'.1	11.2	3'
HOGG 6	Open Cluster	10h06m.7	-60°29'.9	12	3'
NGC 3247	Open Cluster Nebula	10h23m.8	-57°42'.0	8	4.5'
IC 2581	Open Cluster	10h27m.4	-57°37'.5	4.3	7'
IC 2602	Open Cluster	10h43m.2	-64°23'.7	1.6	50'
NGC 3372	Nebula	10h43m.8	-59°52'.0	3	120'
TRUMPLER 14	Open Cluster	10h43m.9	-59°32'.9	5.5	5'
TRUMPLER 15	Open Cluster	10h44m.8	-59°21'.5	7	4'
BOCHUM 11	Open Cluster	10h47m.3	-60°05'.8	7.9	3.6'
TRUMPLER 17	Open Cluster	10h56m.2	-59°12'.3	8.4	5'
HOGG 9	Open Cluster	10h58m.4	-59°03'.5	10.6	1.5'
NGC 3532	Open Cluster	11h06m.4	-58°40'.0	3.4	53'
IC 2714	Open Cluster	11h17m.9	-62°42'.0	8.2	12'
MELOTTE 105	Open Cluster	11h19m.5	-63°29'.1	8.5	5'



The constellation of Cassiopeia



NGC 7788 – Photograph: DSS

CASSIOPEIA

Diamonds in Cassiopeia's Crown

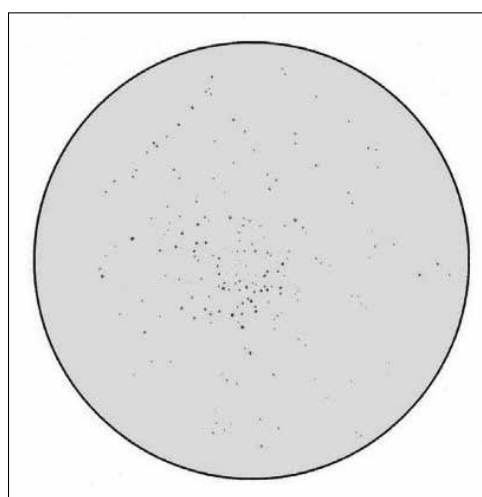
In Greek mythology Cassiopeia was called the Queen of Ethiopia and Cepheus the King. Poor Cassiopeia was punished because of her attractive appearance, as believed by ancient poets, and remained tied down in a sitting position, sometimes upside down. But despite her punishment she displays the richest collection of open clusters in all categories.



Cassiopeia's stars form an easily recognisable W-or-M shape as they move around the night skies' northern Pole through the year. What impresses is the clear constellation image that stands out so strikingly against neighbouring constellations, which are much fainter by comparison.

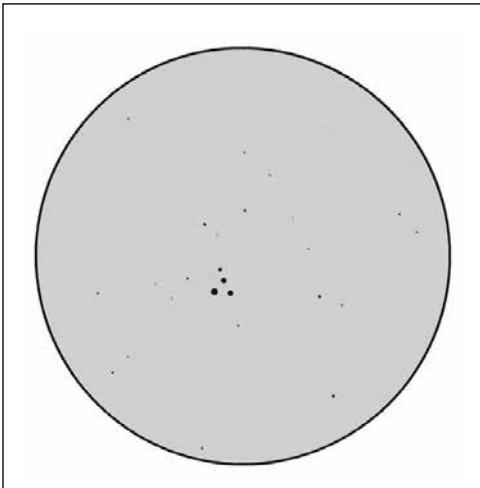
William Herschel obviously spent a lot of time searching for and documenting objects in Cassiopeia. One such object is **NGC 7654** or Messier 52, situated nearly on the border with the constellation Cepheus. Herschel discovered the cluster, which is about 4000 light-years distant, in 1774. The grouping is rich and bright with a few dozen super-white stars standing out beautifully against the background star field. On the cluster's south-western edge is a Type-G giant star with its lovely yellow colour. Several arcs and knots of stars mingle together and spray out into the star field.

In Cassiopeia various clusters have been discovered, and are known by names like Berkeley, Czernik, Collinder, Harvard, King, Melotte, Markarian, Stock, Trumpler and many more. Perhaps the most crowded area of clusters can be found just 2.5 degrees north-west of beta Cassiopeiae – far too many to discuss, with the brighter **NGC 7788** the most obvious among them. The cluster contains stars mainly of magnitude 9 with a few brighter stars towards the middle area. **NGC 7790** to the south-east is slightly larger but fainter. In this degree field of view are also the clusters Berkeley 58, Harvard 21 and Frolov 1 to be seen. The Russian astronomer Vladimir Frolov discovered this last-mentioned group while studying the proper motion of stars in the nearby clusters NGC 7788 and NGC 7790.



NGC 7790 – Open Cluster

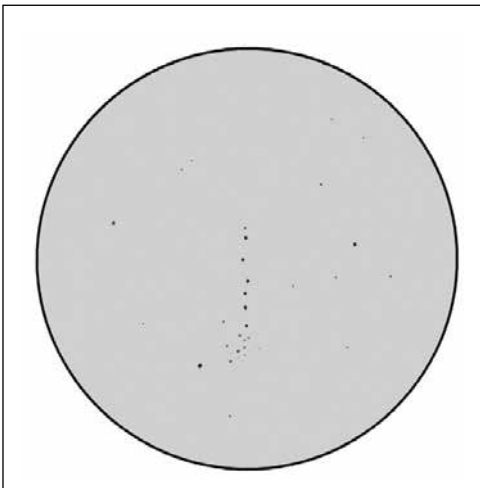
KING 12 is situated 12' further north-west from Harvard 21 and displays a lovely knot of stars with a notable double star on its eastern rim. The King clusters had a special flair about them, usually small with a story to tell in impression. Ivan King, a junior fellow at Harvard College Observatory in the 1940s, had access to plates of the sky surveys taken with the 16-inch Metcalf and 24-inch Bruce refractors. While looking at the plates King began to notice clusters that had never been catalogued and his first 13 marked by him, were published in the observatory's bulletin in 1949.



STREICHER 5 – Asterism

Forming a triangle with beta Cassiopeiae and IC 10 is the small group **STREICHER 5** which consists of only 4 stars but strongly reminded me of the grouping Messier 73 in the constellation Aquarius.

NGC 103 is perhaps one of the smallest clusters, but very distinctive. A hazy patch of faint stars, is quite obvious with strings of fainter stars, giving the impression of the letter H. The brighter stars in this grouping, however, form a sort of horseshoe, with a different impression, all depending on the way you look at it.



NGC 381 – Open Cluster

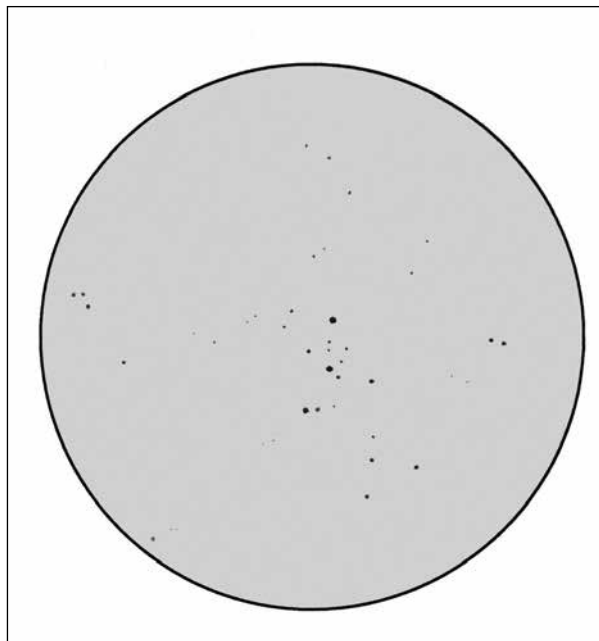
Further east the faint small grouping **NGC 381** is hanging on for life to the southern tip of a magnitude 10 string of stars.

The small open cluster **NGC 133**, which is situated 25' north of kappa Cassiopeiae, was the closest NGC object to the 1572 supernova explosion. The Danish nobleman Tycho Brahe (1546-1601) spotted a brilliant new star in Cassiopeia close to kappa Cassiopeiae on 11 November 1572. In the following days it became brighter than Venus, shone through the blue daytime sky for two weeks and took 16 months

to fade from sight. In September 2008 a team from Germany, Japan and the Netherlands observed Tycho's supernova exploding in 1572 via a 436-year-old light echo. The team was in fact able to model the outburst in detail. It is the first supernova in our galaxy to be classified by its outburst spectrum. The delayed signal or light echo allowed astronomers led by Oliver Krause of the Max Planck-institute for Astronomy in Germany to sample light from the original outburst. They concluded that a white dwarf star called Type-1a exploded to form the supernova. It became popularly known as Tycho's Supernova.

The brilliant super-white magnitude 2 gamma Cassiopeiae plays host to the two emission and reflection nebulae **IC 59** and **IC 63**, situated 20' north from gamma Cassiopeiae. But sadly, gamma's overwhelming glare just washed away the nebulae from any attempt to glimpse them. Both display sort of small flare-out pieces of nebulosity. Perhaps with the utmost care and dark skies and the help of a UHC (ultra-high contrast) filter, averted vision and a lot of luck it would be possible, if gamma is taken out of the eyepiece field of view.

One of the four stars prominent in the constellation is delta Cassiopeiae, just a degree north-east of **NGC 581** or Messier 103. The area is very rich in clusters, all different in shapes and sizes. However, M103 is easily seen in a triangle shape, quite outstanding against the background star field. Against the southern part of the grouping, embedded between a sprinkling of fainter members, is a lovely yellow-orange magnitude 8 star. The sharper arrow pointing north contains the double star Struve 131, two white-coloured stars, magnitude 6 and magnitude 9, with a separation of 28" in a position angle (PA) of 145°.

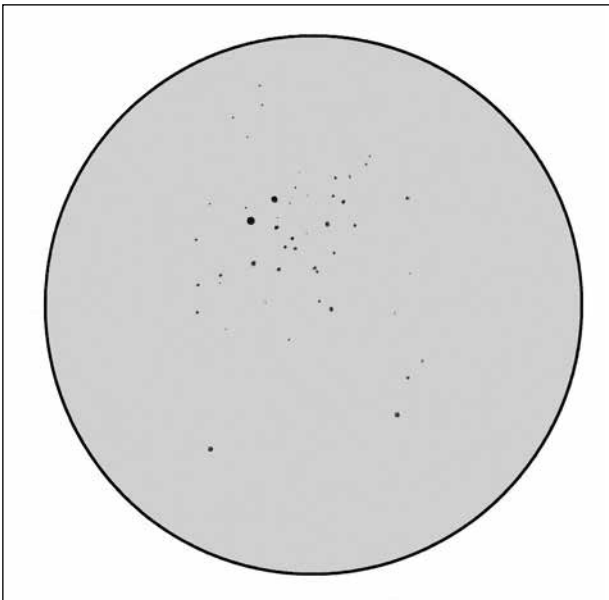


NGC 581 – M103 – Open Cluster

To complete the constellation shape is the magnitude 3 epsilon Cassiopeiae, barely half a degree east the planetary nebula **IC 1747** is playing hide and seek. Only 13" in size it is fairly smooth, round and perhaps not that difficult to spot in ideal dark skies with a fairly large amateur telescope. The planetary is surrounded by a few faint stars protecting its position.

Close to the border with Perseus is a rich nebulous area, home to many clusters interspersed with nebulosity and stars. **IC 1805**, perhaps the best known, is called the Red Heart Nebula. In well-documented pictures it looks like a heart with two chambers, with the extended nebula as the baby embryo. Among amateurs its nickname then became the Heart and Soul Nebula.

The much more outstanding group **MELLOTTE 15** is covered in mist on the western edge of IC 1805 and divided by a very faint string of stars running east-west.



NGC 457 – Open Cluster

A cluster well-known and very popular among amateurs in the northern hemisphere is **NGC 457**, which needs no introduction whatsoever. It is a young star grouping but is uncertain whether the stars are bound together. What is not debatable is that it is one of the prettiest clusters, outstanding, bright and special, popularly known as the Owl Cluster. The stars form a pair of wings extending east-west with the eastern wing slightly more prominent. One of the innermost body stars shines with an attractive orange light. The two owl eyes are the magnitude 5 phi Cassiopeiae and a magnitude 7 blue

coloured star. NGC 457 got its common name in 1977 when David J. Eicher saw an owl figure formed by the cluster's two brightest stars and overall shape.



NGC 147

Photograph: Bernhard Hubi



NGC 185

Photograph: Johannes Schedler

In the far southern part of Cassiopeia, 2.5 degrees from the border with Andromeda, are **NGC 147** and **NGC 185**, two faint companion galaxies of the great Andromeda galaxy. Sadly, they are both fainter than magnitude 12, but I managed to glimpse NGC 147 as a ghostly blur lacking any central concentration and NGC 185 display only a faint roundish glow.

When all is said and done, the Queen will not disappoint any observer as she shows off her jewels in the large variety of clusters glittering within the framework of the constellation.

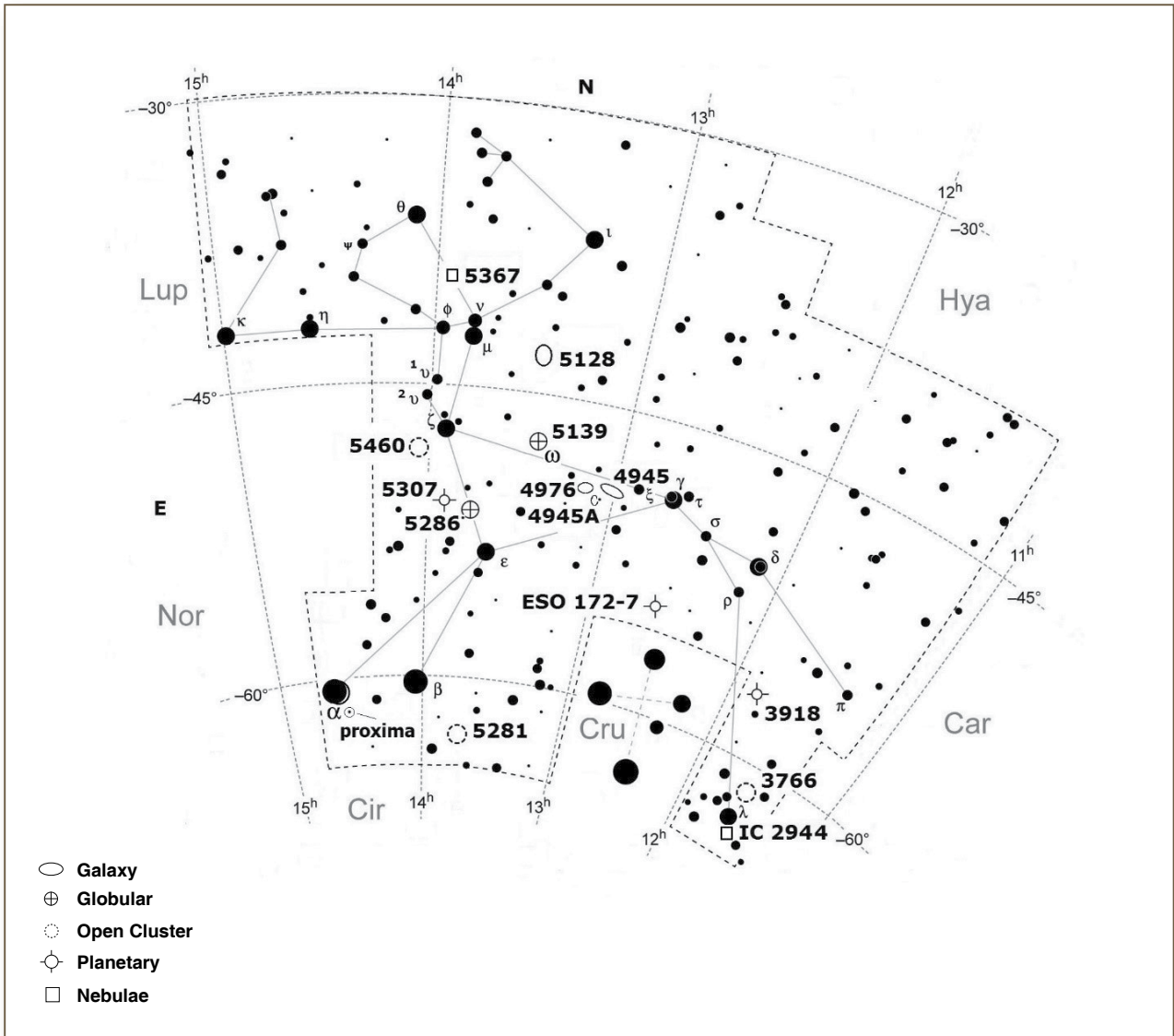
OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 103	Open Cluster	00h25m.3	+61°21'.0	9.8	5'
NGC 133	Open Cluster	00h31m.2	+63°22'.0	9.4	5'
NGC 147	Galaxy	00h33m.2	+48°30'.1	9.5	13.5'×8.2'
NGC 185	Galaxy	00h39m.0	+48°20'.2	9.2	12.5'×10.4'
IC 59	Nebula	00h56m.7	+61°04'.0	10	10'×5'
IC 63	Nebula	00h59m.5	+60°49'.0	10	8'×5'
NGC 381	Open Cluster	01h08m.3	+61°35'.4	9.3	6'
STREICHER 5 DSH J0114.8+5947	Asterism	01h14m.8	+59°47'.5	9.5	5.5'
NGC 457	Open Cluster	01h19m.1	+58°20'.4	6.4	13'
NGC 581 Messier 103	Open Cluster	01h33m.2	+60°42'.0	7.4	6'
IC 1747	Planetary Nebula	01h57m.6	+63°19'.4	12	13"
IC 1805	Nebula	02h32m.7	+61°27'.4	7	50'×60'
MELOTTE 15	Open Cluster	02h32m.7	+61°27'.0	6.5	22'
NGC 7654 Messier 52	Open Cluster	23h24m.2	+61°35'.3	6	12'
KING 12	Open Cluster	23h53m.0	+61°58'.0	9	2.5'
NGC 7788	Open Cluster	23h56m.7	+61°24'.0	9.4	9'
NGC 7790	Open Cluster	23h58m.4	+61°12'.5	8.5	17'



Tycho Brahe
Photograph: Wikipedia



The old Tye Church in Prague, Czech Republic, is the last resting place of Tycho Brahe in the church floor in front of the altar with his statue carved in wood next to it.



The constellation of Centaurus



Centaurus Southern Milky Way – Photograph: Dieter Willasch

CENTAURUS

A Constellation like no Other

In Greek mythology a centaur is a creature described as part horse, part human. William Morris describes the centaur as "a mighty grey horse trotting down the glade, over whose back the long grey locks were laid, for to the waist was man, but all below a mighty horse."



At times we've tended to dwell more on constellations containing a number of faint objects. Well, this chapter promises to be a bright-object delight! The constellations Centaurus and Orion are the only two constellations that boast two first magnitude stars.

I've tried in vain to identify both man and animal in the starry formation. Centaurus, however is a gentle centaur, home to some of the most excellent bright objects that a constellation can possibly offer. The figure is approximately 60 degrees across and ranked 9th in terms of size. It is a constellation extraordinarily rich in bright stars, and wrapped around the constellation Crux towards the east. Join me as I reveal some magnificent bright objects such as globular clusters, planetaries, many open clusters and numerous galaxies.

The northernmost bright star of the figure, magnitude 2 theta Centauri, also seen perhaps as the head of the animal-man, is a convenient point of departure from which to explore this rich constellation, step by step. About 4 degrees south of theta Centauri, we find the nebula **NGC 5367**, which is quite bright, embedded in nebulosity. The reflecting nebula extends hazily to the north-east, with the south-western part slightly larger and box-like in shape. This nebula was included in the Catalogue of Bright Nebulosities in Opaque Dust Clouds by Bernes as No. 147, which appears relatively bright on a blue photographic plate.



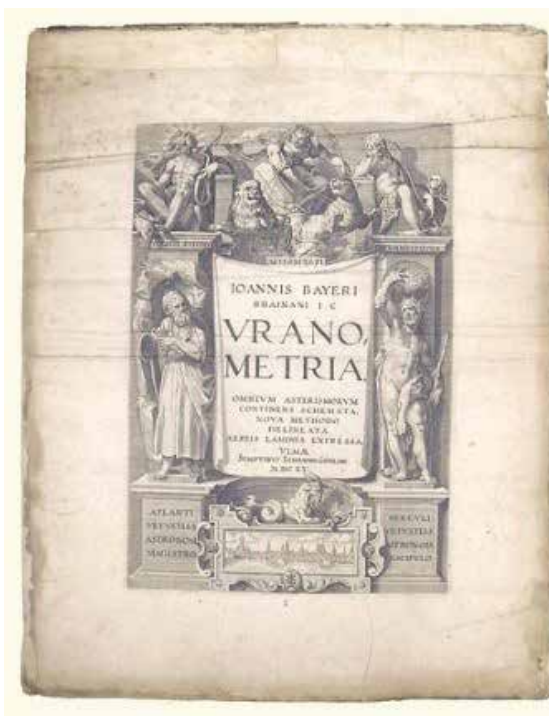
NGC 5367 – Photograph: IRIDA Observatory



NGC 5128 – Photograph: Dieter Willasch

One of the most interesting galaxies in the sky is definitely **NGC 5128**, also known as Dunlop 482. It is situated in the starry creature's chest, more or less between magnitude 2.7 iota and magnitude 2.5 zeta Centauri. This southern elliptical galaxy, also known as Centaurus A, is an intense radio and x-ray source and only 11 million light-years distant. It is an excellent, large, slightly oval galaxy divided into north-east and south-west lobes, separated by an uneven dark band. In the south-western segment, a few stars can be seen with a magnitude 9 star embedded in the visible band.

With higher magnification this part of the band appears looped out with a kink; whereas the eastern part of the band is thinner and darker. Uneven knotted areas become evident with averted vision and the soft lobes grow in size. This galaxy is dubbed the Hamburger Galaxy, and the astronomer Edmond Halley was the first to document its non-stellar nature, however, James Dunlop observed and discovered this interesting and very peculiar galaxy from Parramatta, New South Wales in 1827. Deep photographs taken of the galaxy show ripples, which means that it has swallowed numerous small galaxies.



A mere 4.5 degrees south we find one of the greatest objects of the southern sky, none other than the globular cluster **NGC 5139**, better known as omega Centauri. NGC 5139 was plotted in the Almagest of Ptolemy over 1800 years ago and was catalogued as a magnitude 4 star in the early 17th century by Johann Bayer. Bayer was a German astronomer, whose book Uranometria in 1603, promulgated a system of identifying all stars visible to the naked eye. NGC 5139 has approximately one million members and is about 17 000 light-years distant.

Uranometria 1603

Photograph: University of Glasgow

The first telescopic observer discovered and identifying NGC 5139 as a nebula, was Edmond Halley, who observed it from Saint Helena, Tristan da Cunha in 1677. James Dunlop was the first to resolve this cluster, also known as Dunlop 440 into a beautiful globe of stars.

Ladder Hill Observatory Saint Helena
Tristan da Cunha – Credit: Oscar Wilde



Does something like “very impressive, extremely large and overwhelmingly rich mass of stars” begin to do it justice to NGC 5139? To describe it further, Omega Centauri consists of a multi-mixed of magnitude stars exploded randomly, almost three dimensionally from a dense bright core. The inner compact area also displays an outer oval section, spraying faint stars in chains and lanes beyond the edge of imagination. In the western



NGC 5139 – Photograph: Dieter Willasch

part of the globular, about two-thirds of the way from the core, a dark lane appears to cut off a section. With higher magnification, two dark oval patches can be seen embedded in the busy core; probably a less dense area of stars. The eastern part of the globular seems somewhat densely compiled. Faint stars appear crowded together in tight little knots and more so toward the southern part. The late Mary FitzGerald said it resembles a pot filled with white sugar, perhaps the best way to sum it up! Scientists have suspected now that it is very likely that Omega Centauri is not a globular cluster at all, but a dwarf galaxy stripped of its outer stars. This unique object is about 10 times more massive than other normal globular clusters in the visible universe.

Centaurus is home to the beautiful edge-on galaxy **NGC 4945**, also known as Bennett 57 and Dunlop 411, which is situated 4 degrees south-west of Omega Centauri. In shape, this spiral galaxy may resemble our own Milky Way. Only a pair of binoculars and an ideal, dark night sky are necessary to observe this galaxy. This object was discovered by Dunlop from Parramatta, New South Wales.

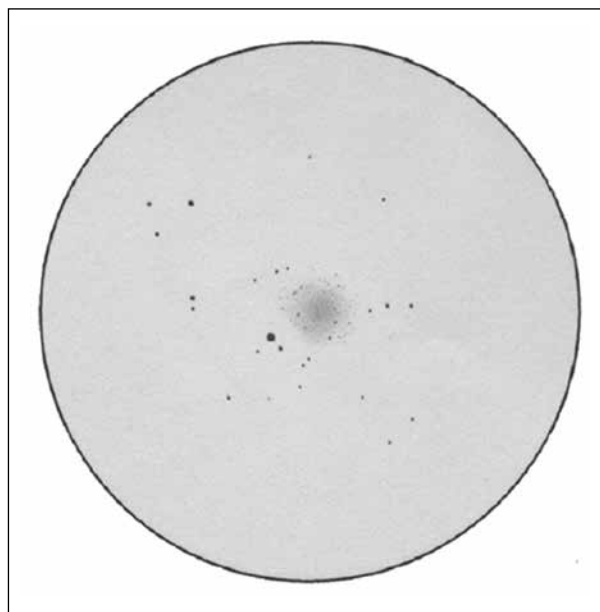
My humble observation reveals NGC 4945 as a pencil-like galaxy, elongated in a north to south direction and gradually getting brighter towards the nucleus, with a few foreground stars embedded. It is fairly uniform in brightness, except towards the fading ends. Higher magnification reveals mottled areas on the surface. The southern part of this galaxy is not as bright as the uneven northern part. In a fine star field towards the west, runs a chain of magnitude 12 stars that appears to skip away from the galaxy. It is a Seyfert galaxy and happens to be the second brightest object of its kind observed in gamma-ray. Matter that enshrouds it prevents the less energetic radiation from escaping. Towards the east of NGC 4945 between faint stars is **NGC 4945A**; a soft very slight smear of light close to a relatively bright field star.

NGC 4976, also known as Bennett 58, displays a slightly elongated north-west to south-east oval 30' towards the north-east of NGC 4945. Despite its small size the galaxy has a bright star-like nucleus, which gradually fades away into the oval's haziness.



This photograph by Lucas Ferreira includes galaxies NGC 4976 top left, the edge-on bright galaxy NGC 4945 with the faint NGC 4945A close to a star towards the east.

Centaurus boasts exceptional objects like the globular cluster **NGC 5286** which is situated only 2.3 degrees north-east of epsilon Centauri. NGC 5286 is also known as Dunlop 388. The globular cluster is bright and large with attractive, faint pinpoint stars, randomly visible like glittering diamond dust and displaying a broad concentration towards the core, with a slightly hazier outer envelope. It is situated just 5' north-west of an orange magnitude 4.5-star, a spectroscopic binary star with a period of 437 days.



NGC 5286 – Globular Cluster

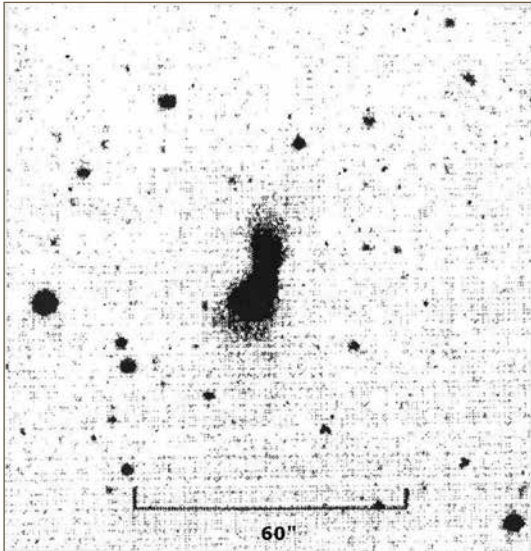
About 44' to the north-east of NGC 5286 the small, round planetary nebula **NGC 5307** exudes a soft glow with diffused edges and no apparent central star.

NGC 5460 also known as Dunlop 431 is one of Dunlop's clusters which pleases the eye. The group is situated a degree east from zeta Centauri. It is beautifully composed with stars that gleam in separate small groups, resembling a half-moon, a type of square and another separate triangle combination. It stands out well from the background star field in a north-south line and is an exceptional sight to behold. Mr. Dunlop seems to have had a great fondness for strange, small, open clusters as demonstrated in this very nice group with a lot of character. Dunlop writes: "A curious curved line of small stars, of nearly equal magnitudes".

Up against the centaur's slender hind leg and close to the western part of the constellation Crux, is found one of the most remarkable planetary nebulae in the southern skies. **NGC 3918** displays a round, bright and easy glow, well defined against the background star field. Also known as the Blue Planetary, it possesses a distinctive hazy blue-green colour. The central magnitude 14.5 star is difficult to see because of the planetary high surface brightness. John Herschel discovered this remarkable object in 1834.

Still in the rear area of the human-animal constellation, the open cluster **NGC 3766** also known as Dunlop 289 can be picked up, situated approximately 1.5 degrees north of lambda Centauri. It is a fine bright scattering of various colourful magnitude 9 to 12 stars forming an attractive curly rolled up impression. Faint stars forming strings and loops with a very dense centre. Approximately 250 stars have made this cluster their home and the grouping can also be picked up with binoculars.

The area around lambda Centauri is covered in haziness. Embedded in the southern part of the nebulosity, are **IC 2944**, also known as the Running Chicken Nebula. The area is slightly ill defined as a north-east to south-west patch. It is bracketed by lines of faint stars that form a sort of V-shape pointing north-east. The trick here is to detect some of the Thackeray's dark globules embedded in the haze, with a telescope and in pristine dark skies.



ESO 172-7 – Photograph: ASSA
Ian Glass

A strange object catalogued as **ESO 172-7**, was indicated "peculiar", as at the time astronomers were not aware of the object's obscure nature. It has since been identified to be one of the coldest objects in the universe. This unusual object is situated just north of the constellation Crux. Ian Glass and G. Werner, were the first to note this unusual nebulosity as butterfly or bow-tie in shape, during an inspection of print number 172 from the ESO Quick Blue Survey on 16 August 1978. ESO 172-7 appears to belong to the class of bipolar nebulae, and is just visible on the Franklin-Adams Atlas plate of the region, taken in 1910. The central star,

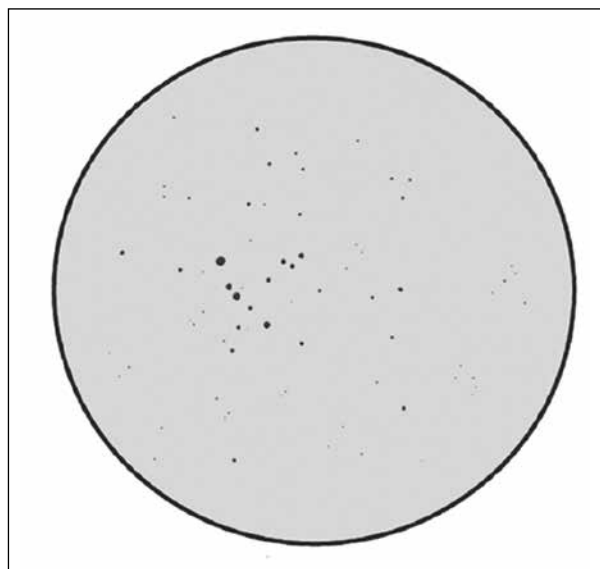
near spectral Type-G0 III, is surrounded by a dust shell. This object was named the "Boomerang Nebula" in 1979. ESO 172-7 resembles two diffused magnitude 11 stars closely on top of one another with the use of very high magnification through a larger telescope. The double-lobed nebula appears even in brightness, except for a small broken middle. I must thank Ian Glass who provided me with the information and 1978 photograph of the object.



Boomerang Telescope – Photograph: Wikipedia

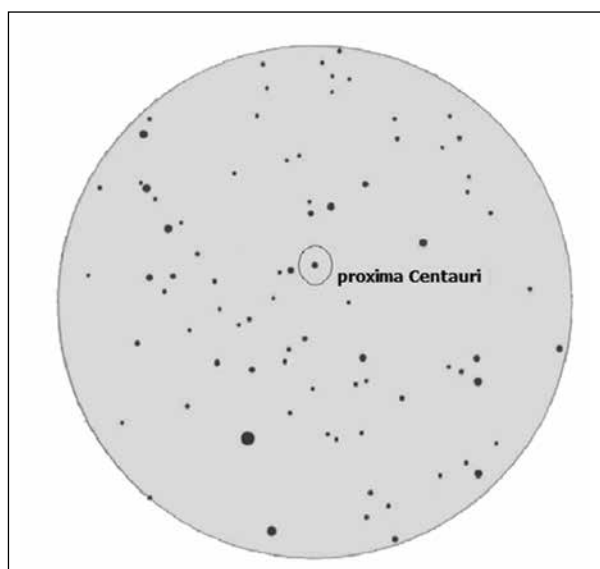
Quite interesting is the aptly named astronomy station, Boomerang (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics), housed at the South Pole, Antarctica. The experiment was measured the cosmic background radiation to study and reveal the very early moments of the universe.

The open cluster **NGC 5281** also known as Dunlop 273 is situated close to the front hoof of the centaur, just 3.3 degrees south-west from beta Centauri. NGC 5281 is very special with the brighter stars in an unusual cross shape. Five bright stars, along with seven fainter ones, form two gently curved lines, making the shape of a cross. Only one star is a little askew from the otherwise almost perfect cross. This cluster contains about 40 various magnitude stars.



NGC 5281 – Open Cluster

The lovely bright star alpha Centauri, also known as Rigel Kentaurus to the Arabian astronomers, meaning “the foot of the centaur”, consists of three members, the nearest stars to our Solar system. The stars alpha 1 and 2 Centauri orbit around a common centre of mass with a period of 79.90 years. Their separation ranges between 1.7” and 22” respectively. The nearest star and third member of the system, the magnitude 11 proxima Centauri, is situated 2 degrees south-west of the pair. It was discovered in 1915 by Robert Thorburn Ayton Innes (1861–1933), and is also referred to as “Innes’ Star”. The first parallax observation was done in 1832–1833 by Thomas Henderson from the Royal Observatory, Cape of Good Hope. Its parallax is now considered to be 0”.742, giving a distance of about 4.396 light-years (Ian Glass). John Herschel called alpha 1 and 2 Centauri “beyond any comparison, the finest double star in the sky”.



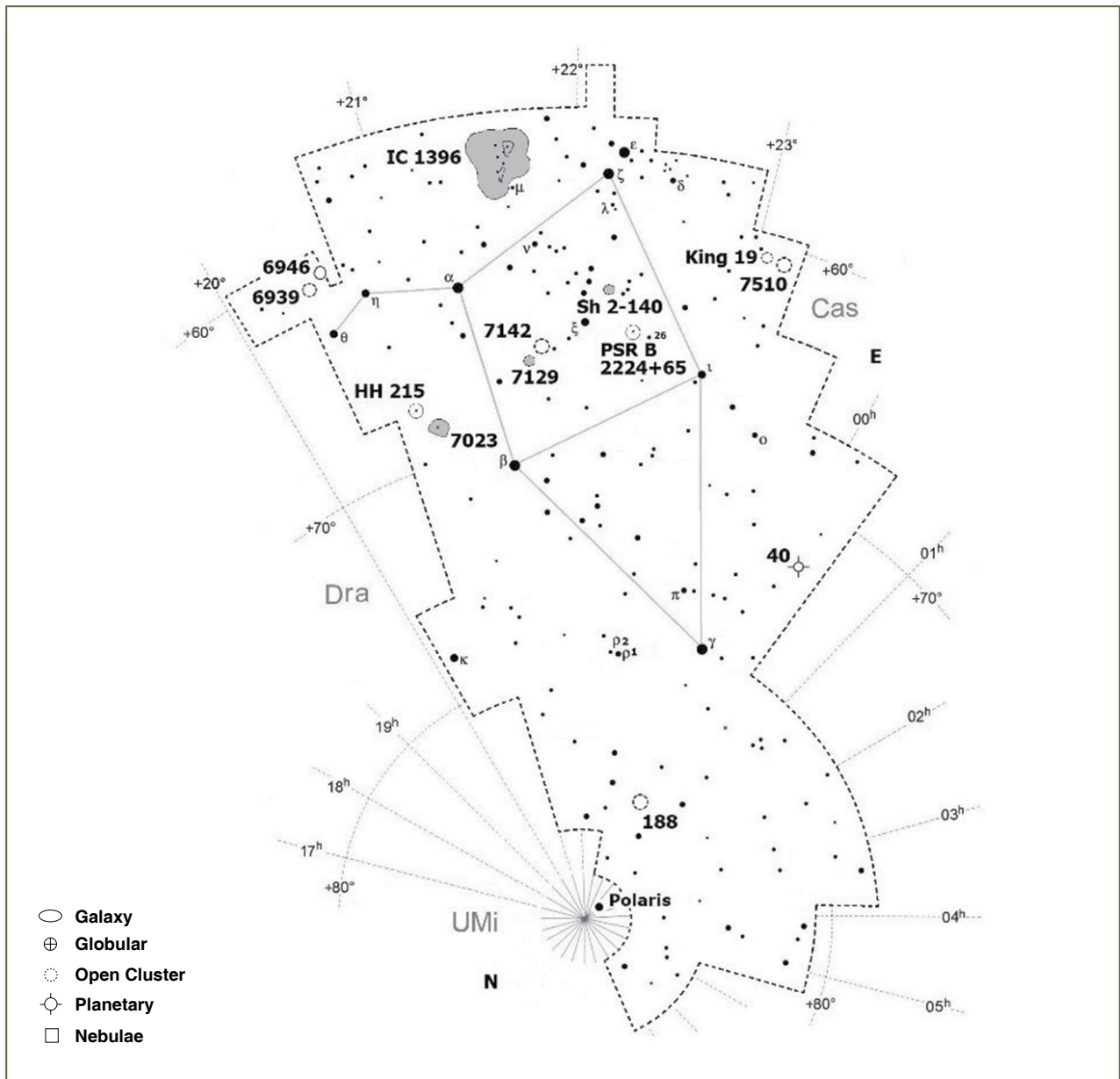
What a fine constellation to have on our southern door-step!



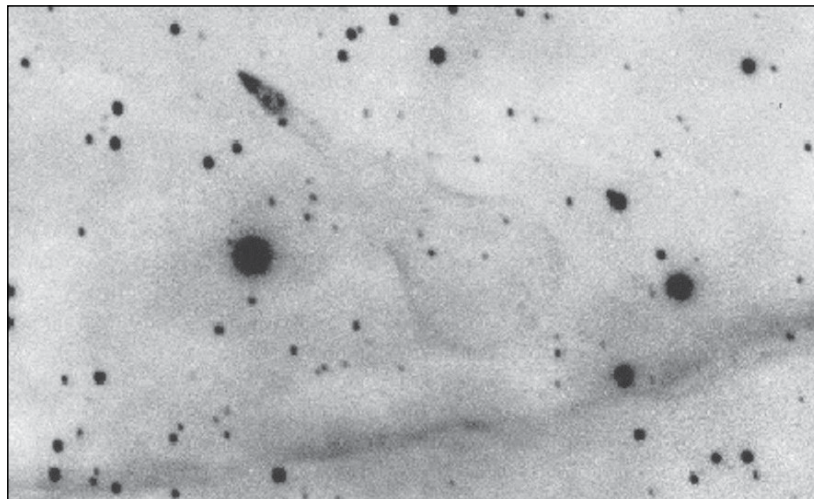
James Dunlop – Pencil Sketch: Kathryn van Schalkwyk

Scotsman James Dunlop was born on 31 October 1793 in Dalry, near Glasgow in Scotland. Thirty-three years later he was in Australia, at the eyepiece of a 9-inch f/12 reflector, searching the southern sky for nebulae and clusters. Dunlop constructed the telescope himself, making the mirror from burnished metal (speculum), and using methods similar to those of William Herschel. His sky survey produced a catalogue with 629 objects observed at Parramatta in New South Wales (Catalogue of Nebulae and Clusters of Stars in the Southern Hemisphere), for which he was awarded the prestigious Gold Medal of the Royal Astronomical Society in 1828. He died on 23 September 1848, and is perhaps remembered best, as the Messier of the southern skies.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 3766 Dunlop 289	Open Cluster	11h36m.1	-61°37'.0	5.3	12'
IC 2944	Nebula	11h37m.8	-63°21'.2	10	35'
NGC 3918	Planetary Nebula	11h50m.3	-57°10'.8	8.4	12"
ESO 172-7	Planetary Nebula	12h41m.8	-54°14'.9	12	60"
NGC 4945 Dunlop 411	Galaxy	13h05m.4	-49°27'.8	8.6	19.8'×4'
NGC 4945A	Galaxy	13h06m.6	-49°41'.5	12.5	2.5'×1.6'
NGC 4976	Galaxy	13h08m.6	-49°30'.4	10.1	5.4'×3.3'
NGC 5128 Dunlop 482	Galaxy	13h25m.5	-43°01'.0	6.7	31'×23'
NGC 5139 Dunlop 440	Globular Cluster	13h26m.8	-47°28'.8	3.5	36.3'
NGC 5286 Dunlop 388	Globular Cluster	13h46m.4	-51°22'.4	7.2	9.1'
NGC 5281 Dunlop 273	Open Cluster	13h46m.6	-62°54'.9	5.9	5'
NGC 5307	Planetary Nebula	13h51m.1	-51°12'.3	12.1	13"
NGC 5367	Nebula	13h57m.7	-39°58'.7	9.5	2.5'
NGC 5460 Dunlop 431	Open Cluster	14h07m.6	-48°20'.5	5	25'
proxima Centauri	Star	14h29m.7	-62°40'.7	11	*



The constellation of Cepheus



PSR B2224+65 – Guitar Nebula – Photograph: central.oak.go.kr

CEPHEUS

The King

The constellation Cepheus, known as the King of Ethiopia, can be found suspended from the northern Milky Way, accompanied by his Queen Cassiopeia and their daughter Andromeda. The shape of the constellation strongly resembles that of a square house with a pitched roof. Cepheus is a northern constellation which borders on the polar constellation Ursa Minor. It is not visible to southern hemisphere observers but can be seen throughout the year from northern hemisphere areas.



Cepheus is a constellation that holds a few exceptional objects, some of them having been given the strangest nick names, like the Cave Nebula, the Bubble Nebula, the Elephant Trunk, the Iris Nebula, the Bow-tie Nebula, the Wizard Nebula, the Fireworks Galaxy, and then in that mix of objects also Gyulbudaghian's Nebula.

The King is also proud to have under his rule the pulsar **PSR B2224+65** and its X-ray jet (Guitar Nebula). A former binary companion of the pulsar is perhaps a runaway star, identified as one of the fastest known neutron star racing through space at an estimated 7.75 million kilometres per hour, and about 6000 light-years distant.

The open cluster **NGC 6939** is situated in the far western part of the constellation. NGC 6939 is a fan-shaped mass of faint stars, spraying out towards the east quite orderly and well seen. The surface has a granular appearance, indicating fainter members, and with averted vision some of these faint stars may perhaps be spotted. A lovely knot of faint stars can be glimpsed north-east of the cluster core, but only with the utmost care. David Knisely called the open star cluster the Right-Angle Cluster, due to its oddly well-ordered rows of stars that seem to form a distinct right angle. Others have referred to the cluster as the Seacrest Cluster in reference to the stadium lights at Lincoln, Nebraska's Seacrest field, but that name has more or less faded.

The oval galaxy **NGC 6946** is barely 40' towards the south-east, one of the nearest open spirals, but still very much further away in the distance from the cluster. It is a typical Type-SC spiral galaxy, hazy at the edges, with several knots and patches in the spiral arms, with a barely seen brightening towards the small nucleus. Several supernova explosions have been detected over time in this galaxy. The contrast in brightness between the two objects lend a special touch to this field of view.

The very large emission nebula **IC 1396**, close to the southern border with Cygnus is easily seen through binoculars in transparent dark skies. This large hazy nebula is home to a number of various magnitude stars in knots and strings, a denser concentration towards the middle and patches of dark areas. Always wondered where to find the famous Herschel's Garnet Star? Well, wonder no more; simply find the 3.9 magnitude mu Cephei in the northern fringes of IC 1396. Herschel's Garnet Star (mu Cephei) stands out proudly in a rich orange colour. The star, classed as a Type-M2 supergiant is one of the brightest of its kind, very large and luminous.



Open clusters always show some sort of special character, bringing pleasure to the eye. One such cluster is **NGC 7510**, barely a degree west of the border with Cassiopeia. The cluster contains about a dozen faint stars in a close, elongated, strange bar formation north-east to south-west, an attractive sight. The arrowhead stars bent at the north-eastern tip and barely seen, covered in a nebulosity glow.

NGC 7510 – Photograph: CloudyNights

Ivan King of the Harvard College Observatory discovered a group of stars, now catalogued as **KING 19**, which reigns over its own kingdom domain so to speak; it comprises only a handful of stars in a loose irregular triangular shape and is relatively outstanding against a busy star field.

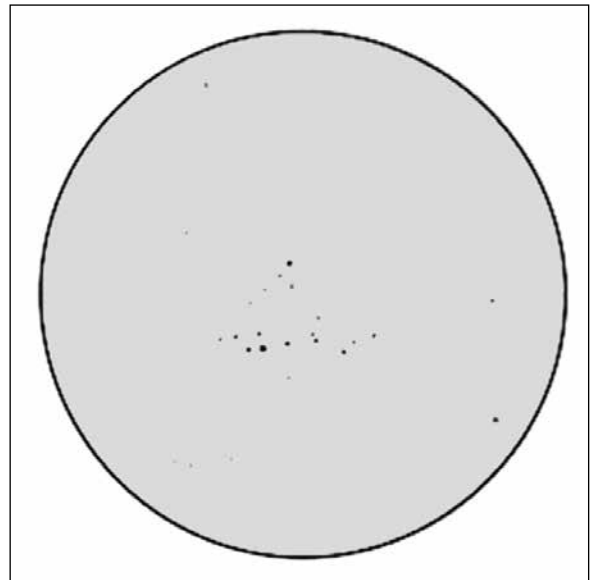


NGC 40 – Photograph: British
Astronomical Association

Close to the Cassiopeia border in the north-eastern part of the constellation, an outstanding planetary nebula can be found, one not shy to make itself known to the observer. **NGC 40** is bright and easy to see as a north-east to south-west oval with a prominent central star known as a short-lived Wolf-Rayet type.

Inside the four-cornered house-shaped constellation two objects reside closely together in harmony. The open cluster **NGC 7142** is rich in starlight which could well emanate from a few dozen unresolved stars. Situated 20' north-west is the reflection nebula/cluster **NGC 7129**. It is one of a kind and one to remember: only a small group of six outstanding stars in a square shape with the four brighter ones towards the north fully covered in haziness.

The diffuse nebula **Sh 2-140** is a prototype cometary globule which is part of the Cepheus bubble of expanding gas and dust around a few Type-OB2 stars. The beauty in the nebula is the group of stars known by its nickname, the Sailboat Cluster, giving a truly remarkable impression. When I visited a northern Astro Camp a few years ago I made a sketch of it but could not detect the nebulosity around it at the time. Probably using a nebula filter would have brought the haziness out.



Sh 2-140

In the western part of the constellation is probably one of the most beautiful diffuse nebulae ever seen, not so much through the eyepiece of a telescope but definitely through the eye of the Hubble telescope. **NGC 7023** is popularly known as the Iris Nebula, a reflection nebula surrounding a magnitude 7 star. When I observed this nebula through an 8-inch telescope I had no trouble seeing its glow with the outstanding star towards the brighter centre clearly surrounded by a slightly irregular haze extending a little to the north-east.



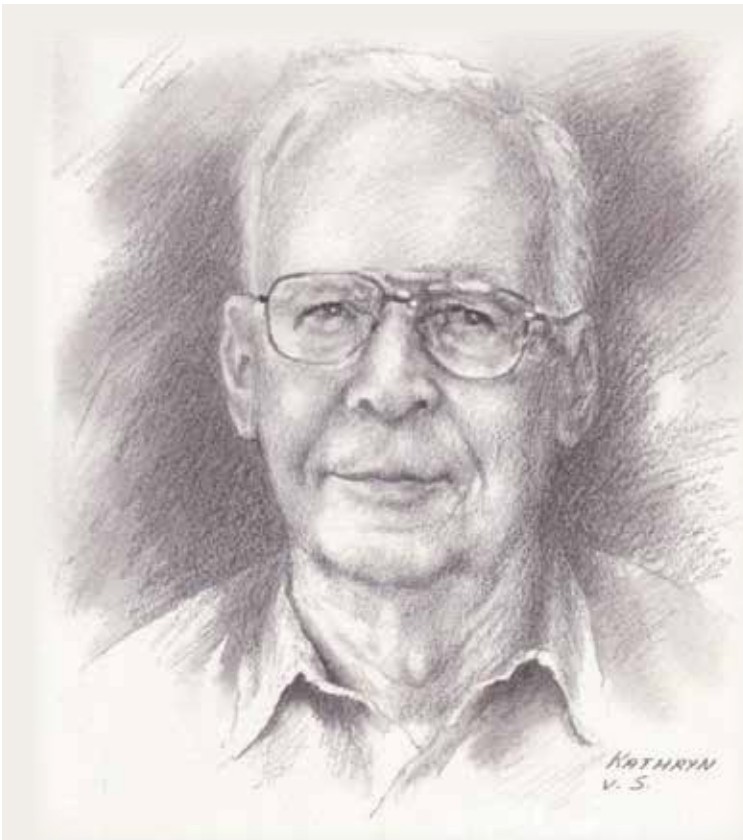
NGC 7023 – Photograph: Hunter Wilson

One of the most northerly open cluster is **NGC 188**, out of sight but not out of mind for southern observers. It comprises a swarm of faint stars in a somewhat roundish shape with beautiful strings random curling through the cluster. NGC 188 is one of the oldest clusters known, at an estimated 7 billion years, and more than 5000 light-years away.



NGC 188 – Photograph: Wikipedia

The variable star PV Cephei, fainter than magnitude 16, is situated half a degree south-west of NGC 7023. PV Cephei has a faint variable V-shaped nebula, known as **HH 215** (Herbig-Haro), or the Gyulbudahian's Nebula that is extending north from the star. It is a little-known variable reflection nebula, similar to Hubble's Variable Nebula. This nebula, which changes brightness and shape over many months or even years, has been a real challenge even for an 18-inch telescope. Armen Gyulbudaghian, an Armenian astronomer, discovered this nebula in 1977 at Byurakan Observatory, apparently during a survey for new Herbig-Haro objects. The reflection nebula is also catalogued as GM 1-20. The M stands for Magakyan, the co-author of the discovery paper.



George Howard Herbig (1920–2013) was an American astronomer at the University of the Hawaii Institute for Astronomy. He was known for the discovery of the Herbig-Haro objects. His specialty was stars at an early stage of evolution, a class of Type-Ae/Be intermediate pre-main sequence stars, named Herbig stars after him. But he was perhaps best known for his discovery, with Guillermo Haro, of the Herbig-Haro objects; bright patches of nebulosity excited by bipolar outflow from a star being born. Herbig also

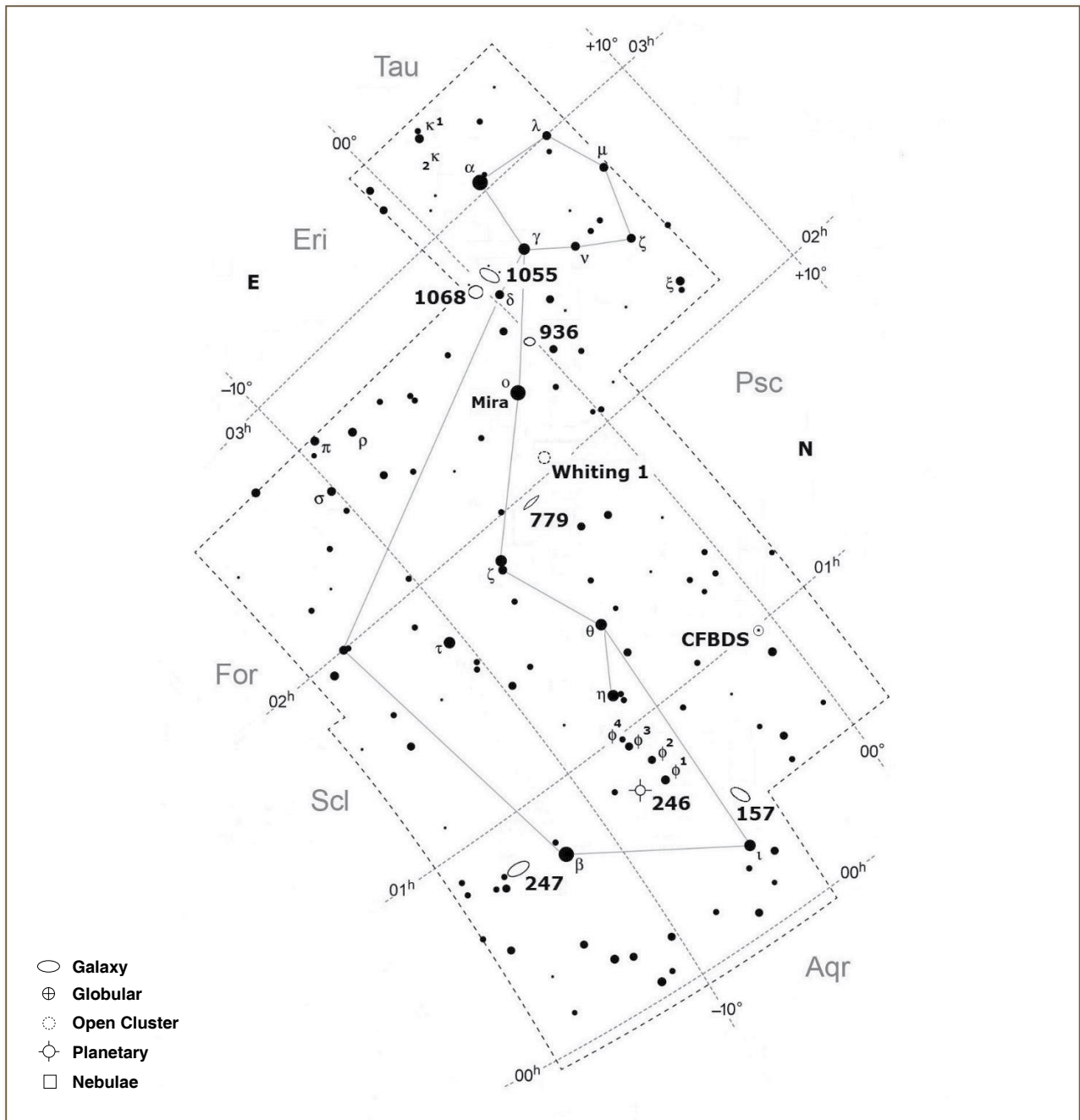
made prominent contributions to the field of diffuse interstellar band (DIB) research, especially through a series of nine articles published between 1963 and 1995 entitled the Diffuse Interstellar Bands.

The starry King Cepheus is not by any means shy to show off the rare and interesting objects in his kingdom, and rightfully so; to be part of a monarchy is not everyone's privilege, even if the monarch is a King fixed to the starry sky.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 40	Planetary Nebula	00h13m.4	+72°31'.0	10.7	37"
NGC 188	Open Cluster	00h44m.5	+85°20'.0	8.1	13'
NGC 6939	Open Cluster	20h31m.4	+60°38'.3	7.8	7'
NGC 6946	Galaxy	20h34m.8	+60°09'.0	8.8	12'×12'
HH 215	Reflection Nebula	20h45m.8	+67°58'.3	16+	26"
NGC 7023	Reflection Nebula	21h00m.5	+68°10'.0	7.1	8'
IC 1396	Emission Nebula	21h39m.1	+57°30'.0	3.5	50'
NGC 7129	Open Cluster Nebula	21h42m.8	+66°06'.0	11.5	7'
NGC 7142	Open Cluster	21h45m.9	+65°48'.0	9.3	4.3'
Sh 2-140	Nebula/Cluster	22h18m.8	+63°15'.4	8.5	9.3'
PSR B2224+65	Pulsar	22h24m.3	+65°20'.3	-	-
KING 19	Open Cluster	23h08m.3	+60°31'.8	9.2	6'
NGC 7510	Open Cluster	23h11m.5	+60°34'.2	7.9	4'



Gylbudaghian's Nebula – Photograph: Pellervo Observatory



The constellation of Cetus

CETUS

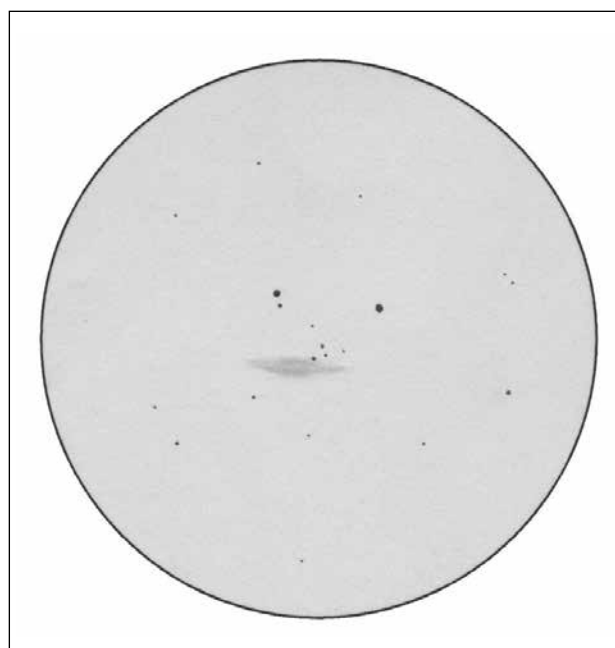
A Monster Whale

The Cetus constellation is situated in the northern part of the sky and ranked as the 4th largest among the documented 88 constellations. Cetus in mythology represents the sea monster sent to kill the princess Andromeda, but legends also point a finger of concern to Draco, another northern hemisphere constellation. The constellation occupies a part of sky that houses mainly galaxies and, sadly, few known clusters or nebulae; but it is famously situated at the south pole of the Milky Way.



About 5 degrees from the Taurus border in the north-eastern corner of Cetus, magnitude 2.5 alpha Ceti also known as Menkar appears to be the watchful eye of the whale. The lovely red-orange giant star can be appreciated through binoculars as a double star with a magnitude 5.6 visible partner, but it is not a physical companion of alpha Ceti.

The magnitude 4 delta Ceti star points the way barely 35' east to **NGC 1055**, one of the most outstanding objects to be found in this constellation. The galaxy displays a soft elongated east-west oval with the middle part slowly brightening to an intense glow. With averted vision the eastern part displays a fade-out tip and is a fraction shorter. The western section in turn, is somewhat slimmer with a defined tip and a small triangle of magnitudes 12 to 13 stars on the northern edge. With higher magnification the dusty dark lane is clearly visible as a thin hair-line. This star city forms a nice triangle a few arc-minutes to the south of two similar stars, a slightly yellow magnitude 6.7 and a plain cream-white magnitude 7.5, which also pairs with a magnitude 10 star. It is a very exceptional star field that rounds off this showpiece galaxy in a very distinctive way. Towards the east is NGC 1072, a very faint north-south edge-on galaxy, which is a real challenge to search out.



NGC 1055 – Galaxy

Another galaxy, quite different in shape and impression, is the well-known **NGC 1068** better known as Messier 77, half a degree south from NGC 1055, and the only Messier object in the constellation Cetus. NGC 1068 is a peculiar Seyfert galaxy displaying a misty appearance with a roundish shape and a very bright star-like nucleus. With a mottled brightness of about magnitude 8.9, one gets the impression of a faint globular cluster rather than a galaxy. Higher magnification, however, reveals soft, barely visible, wisps of nebulosity around the edge. The galaxy is just west of a magnitude 9 foreground star giving the impression of two eyes in the dark of night. Even the stars in the field play the



NGC 1068 – M77 – Photograph: Dale Liebenberg

game in pairs, which is quite pleasing. This Seyfert system, which exhibits unusually intense and variable ultraviolet emissions from a tiny star-like nucleus, is probably the sign of gas spinning into a super-massive black hole. It was also one of the first galaxies found to have a large red shift, thus implying that it was receding rapidly along our line of vision. The spiral structure in M77 was first noted by the Earl of Rosse.

The collar on the mighty whale's neck indicates the famous magnitude 6.5 red giant star omicron Ceti, better known as Mira, which means "the wonderful", a name bestowed on it in 1662 by Johannes Hevelius (1611–1687). The star undergoes actual pulsations in size and brightness and varies from as dim as magnitude 9 to as bright as magnitude 3 to 4 and even as high as magnitude 2. The Greek astronomer Hipparchus became the first person to spot the star's light, but recognition as a variable star was credited to David Fabricius (1564–1617), who spotted it rising in 1596 and again in 1609. The cycle is now estimated to be 11 months or close to the value of 332 days. In 2007 astronomers imaged Mira's, ultraviolet smoke trail of about 2 degrees long left behind its 30 000 years of travel through space. Mira's comet-like tail stretches a startling 13 light-years across the sky. Mira, known as a Mira-type star, appeared in Johann Bayer's 17th-century catalogue, where it was assigned the Greek letter omicron. The astronomer William Herschel refers to Mira as a star with a deep garnet colour. A magnitude 12 companion star can be found with a separation of 74.7 and position angle (PA) of 90°. Another lovely red magnitude 9 star can be seen north-east of Mira, which lends a special effect. However, the system was previously identified as multiple in the Hipparcos Input Catalogue.

An easy way to find objects is to look out for triangles among the stars. **NGC 936** is situated west in a long, thin triangle with the star's delta and omicron Ceti. The galaxy appears to be just a faint, roundish glow lying south of a group of four stars. Higher magnification offers no improvement of the view with any sign of the fainter companion galaxies either. The area is packed with galaxies, but if you want to search for them you will need really high magnification, a very dark, transparent sky and a lot of patience.

Globular clusters are concentrated old stellar groups that can be found in the outer Milky Way disc. **WHITING 1** was found on a survey done by A. Whiting, G. Hau and M. Irvan at the Cerro Tololo Inter-American Observatory in 2002 that identified it as a compact cluster of blue stars which could possibly be a very young globular cluster due to an abundance of low metals. The object was later classified as an open cluster only about 5 billion years old. This object is situated 4 degrees west of Mira, but do not expect to make an observation of this very faint and illusive object.



Whiting 1 – Photograph: Sky.com

Sarah Francis Whiting, (1847-1927) was an American physicist and astronomer. At the beginning of the 20th century, a group of women known as the Harvard Observatory Computers under supervision of Edward Pickering helped revolutionize the science of astronomy to map the universe. While doing graduate work Whiting and Annie Connon, who devised a system for classifying stars, also conducted experiments on x-rays.

These women, referred to as "computers," were the only way that Pickering could achieve his goal of photographing and cataloguing the entire night sky.



Sarah Frances Whiting
Pencil Sketch: Kathryn
van Schalkwyk

Further south, towards the middle part of the constellation is **NGC 779**, a relatively bright, quite large, thin ray of light in an elongated north-south direction, with a bright stellar nucleus. Again, you need very dark, transparent skies and relatively high magnification to spot this galaxy, as is the case, sadly, with most of this category objects.

Quite outstanding are the three stars eta, iota and beta Ceti, that form the tail part of the graceful mighty whale, which can be easily identified in the south-western part of the constellation.



Another special galaxy **NGC 247** can be found 2 degrees south of the magnitude 2 beta Ceti also known by the name Diphda. The spindle in a north-south direction is quite outstanding against the background star field with a relatively bright nucleus. With careful observation and higher magnification, distinct markings and perhaps a few star points can be spotted on the dusty surface. NGC 247 belongs to the Sculptor Group of Galaxies and is about 7 million light-years distant.

NGC 247 – Photograph: Dieter Willasch

Situated in the middle area of the constellation is a very exceptional planetary nebula which truly creates an unusual impression. **NGC 246** is well known as one of Cetus's special jewels, and is indeed out of the ordinary. The planetary nebula displays a smoky round-disk that engulfs four foreground stars, with the hot central star very obvious. Filters will bring out a knotty structure on the planetary surface, which sometimes refers to in the appearance of a human skull.



NGC 246 – Photograph: Dieter Willasch

If you want only one object that is worth a visit, then you need not look any further. The very faint galaxy NGC 255 is situated only 30' to the north.

The galaxy **NGC 157** is situated virtually on the western tip of the whale's fin just slightly north-east of the star iota Ceti. The galaxy lies in a north-east to south-west direction and displays a quite prominent nucleus covered in haziness. With larger backyard telescopes and really high magnification it is possible to spot perhaps a few markings on the surface if you are fortunate to have transparent dark skies.

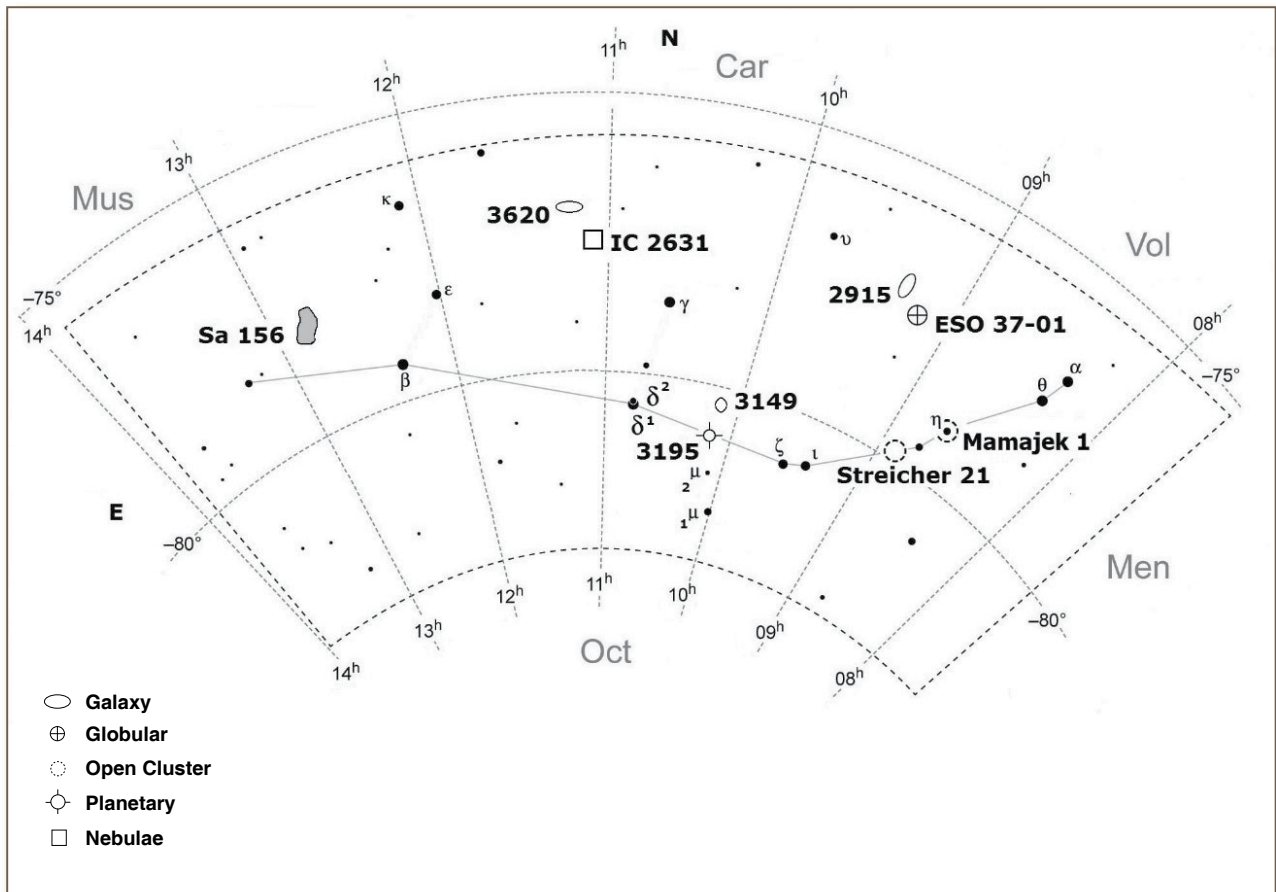
The Canada-France Brown Dwarf Survey (CFBDS) has found the coolest brown dwarf yet, not even 350° Celsius – cool enough to show ammonia in its spectrum. This star, known as **CFBDS J005910.90-011401.3**, has now been put into a new proposed spectral class of Type-Y stars and is situated about 40 light-years away in the constellation Cetus. The special star is situated in the far north-west of the constellation, a degree north-east of the galaxy NGC 307, but spare yourself the effort of looking for it.

Why not swim with the monster whale and discover some of the special objects sharing the waves in the sea of Cetus.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 157	Galaxy	00h34m.8	-08°24'.0	10.4	4.1'×2.4'
NGC 246	Planetary Nebula	00h47m.0	-11°53'.0	8	225"
NGC 247	Galaxy	00h47m.1	-20°46'.0	9.2	19'×5.5'
CFBDS J005910.90 -011401.3	Type-Y Brown Dwarf Star	00h59m.1	-01°14'.1	18	*
NGC 779	Galaxy	01h59m.7	-05°58'.0	11.2	3.4'×1.2'
WHITING 1	Cluster	02h02m.9	-03°15'.1	20+	1'
NGC 936	Galaxy	02h27m.6	-01°09'.4	10.2	5.7'×4.6'
NGC 1055	Galaxy	02h41m.8	+00°26'.0	10.6	7.3'×3.3'
NGC 1068 Messier 77	Galaxy	02h42m.7	-00°01'.0	8.9	8.2'×7.3'



Omicron Ceti (Mira) appears as a small white dot in the bulb-shaped structure at left, and is moving from right to left in this view. The large blue dot at right is a star that is closer to us than Mira. – Photograph: Wikimedia



The constellation of Chamaeleon



Photograph: Irmgard Streicher Raubenheimer

CHAMAELEON

A Memorable Creature

There is a constellation named after one of the cutest little animals on earth, the chameleon. The slow, deliberate, step-by-step movement, elegant curly tail and pre-historic appearance makes the chameleon one of the most memorable creatures ever. The dwarf chameleon species occurs only at the south-westernmost tip of South Africa, in areas of relatively dense vegetation. Other species are found in Madagascar.



According to Auke Slotegraaf, this little land animal probably so impressed the Dutch seafarers that Pieter Plattevoet placed it on record by naming it after a star formation. The constellation was later published by Bayer as a companion to the constellation Musca, the Fly, situated to the north-east. Musca is named after an insect, and dangerously close to the starry Chamaeleon; fortunately, the little starry predator faces west towards the opposite direction. However various atlases indicate different constellation impressions not all seen in the same way.

The constellation Chamaeleon is situated only 10 degrees north of the southern celestial pole. The rich Carina part of the Milky Way can be seen directly north of it. Although the constellation figure is quite faint, and contains no stars brighter than magnitude 4, it must not be underestimated in any way. The starry Chamaeleon stares into the night sky with two wide-open eyes, so to speak, represented by the magnitude 4 alpha and magnitude 4.3 theta Chamaeleontis, situated in the far western extreme of the constellation. The two stars shine with a lovely pale-yellow colour.

When I first heard of the very talented and now well-known South African singer and songwriter, Chris Chameleon, I immediately thought about our own southern Chamaeleon constellation of the same name – both of them so exceptional in their own right! So, while planning this article, I could not resist contacting Chris, and to my utter delight he agreed to contribute with some very appropriate words, written in his distinctive style.



Chris Chameleon
Photograph: Mosselbay
Advertiser

Chris says, "not everybody gets a constellation named after them. Well, I know I don't. But there happens to be this merry coincidence between my name and that of an inconspicuous constellation in the southern sky: Chameleon. and it could just as well have been named after me, because there are many similarities between us. Firstly, it is made up of, primarily, three stars. The letter three has been one of the most important numbers to me for much of my life. Emotional episodes, business ventures and even luck have all come in threes for me. I love the number, it's my favourite number. Furthermore, the fact that it is an inconspicuous constellation is uncannily apt! That is what a chameleon does isn't it? A chameleon is meant to be there, pretty (as far as I am concerned though, I'll settle for 'interesting'!) to look at and unmistakable, but not easy to find in the first place. It blends into the night sky, concealing itself amongst the stellar foliage. Then, the fact that it is in the southern sky also particularly appeals to me. For my work I strut my stuff all over South Africa, in the USA, in the Netherlands, in Belgium, in England, in Namibia, and even in Rwanda! But there is no place I can call home unless it's South Africa. Neither lights nor money nor temptations of an allegedly better life elsewhere prompt me to leave this country and the nocturnal firmament of a karoo night. I am at home in it as much as the Chameleon constellation is in its skies! Finally, it confirms the chorus of what has, to date, been the biggest hit of my career, a song quite appropriately called Sterredank:

*and when I look up and I count my stars
I see how they predict my future
for what I read in their shape and size
is that the road ahead is shiny bright!"*

The magnitude 4 gamma Chamaeleontis stands out exceptionally well because of the deep yellow to orange colour which very aptly indicate the curved back of the little starry creature's form.

The galaxy **NGC 2915** is situated about a degree west of the magnitude 5.4 nu Chamaeleontis, in the northern part of the constellation. The galaxy displays an elongated north-west to south-east glow, pointing north-west to a pair of faint magnitude 13 field stars. Higher magnification and averted vision reveal a haze around the outer edge with a slightly brighter nucleus. About 8' to the south-west of the galaxy, the very yellow to orange magnitude 7.8 star dominates the field of view.

The relatively unknown globular cluster **ESO 37-01**, E3 for short, is situated 43' south of the galaxy NGC 2915. Only three E-objects were found by Lauberts in 1976; E1 is a globular cluster in Horologium, E2 an open cluster in Dorado. Due to loss of stars as a result of tidal effects, E3 is a very loose, star-poor globular cluster, one of the faintest known so far. It reveals itself by just a soft glow between a few faint stars. With averted vision it grows slightly larger, but I was not able to see any points of scattered light. Perhaps this cluster with its unusual name, and reference Chris's important number three, could inspire him to write a new song, dedicated to its unique name and place among the stars!



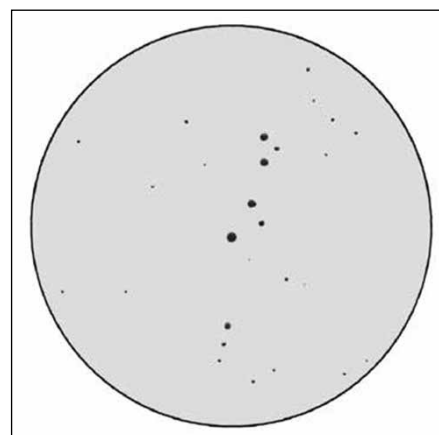
ESO 37-01 – Photograph: The Sky

The stars around eta Chamaeleontis have been identified as a brand-new open cluster **MAMAJEK 1**. The cluster contains approximately ten super-white members which display the same proper motion through space. This cluster was discovered only in 1999 and has proved to be situated just 329 light-years away and was formed about 10 million years ago. Being, as far as we know, the fourth closest cluster to us, three of its members are visible through binoculars. What is more, there is an extremely faint galaxy PGC 24516 within 2' east of eta Chamaeleontis, sharing this new cluster's territory.

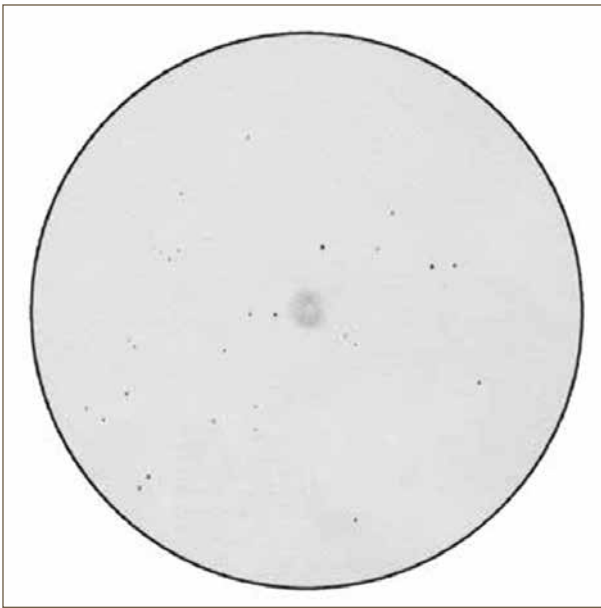


MAMAJEK 1 – Photograph: Lucas Ferreira

The asterism **STREICHER 21** is situated between the star's eta and iota Chamaeleontis. It consists of a few various magnitude stars in a well-formed line from north to south that stands out beautifully against the background star field. The shape of the stars resembles a reptile of another sort to me, complete with a tail pointing to the south.



STREICHER 21 – Asterism

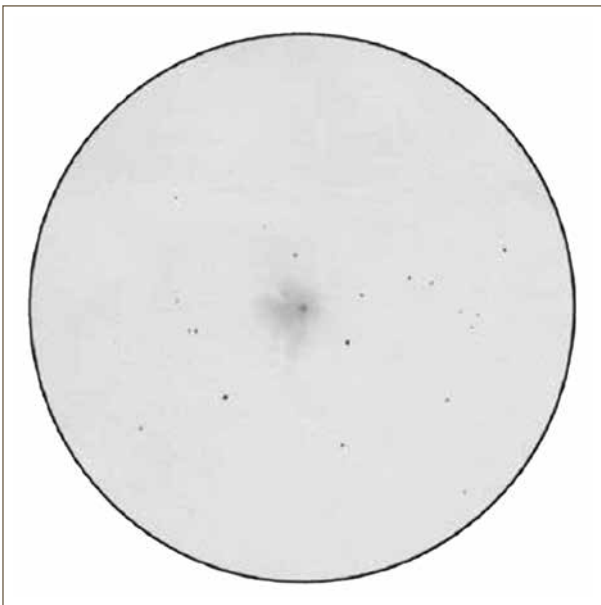


NGC 3195 – Planetary Nebula

The beautiful, bright, remarkable planetary nebula **NGC 3195** is neatly tucked underneath the creature's belly and 1.5 degrees west of the double star delta Chamaeleontis. The planetary nebula is covered in a soft grey mist and is slightly oblong in shape. With higher magnification, more of its characteristics come to the fore. The planetary nebula becomes more clearly defined towards the western side in contrast with the eastern portion, which appears somewhat washed out. With the use of an oxygen filter (O-III) the middle section becomes slightly darker, indicating that the planetary is hollow,

but sadly, there is no central star to be seen. A few bright stars can be seen just north of the planetary nebula showing the colours of yellow and orange. John Herschel discovered this planetary nebula in 1835.

Riding on the back of the starry Chamaeleon is **NGC 3149**, a very faint galaxy situated just around the corner, only 30' north of NGC 3195. This faint, slightly oval, hazy glow is barely visible, with just a glimpse of the nucleus. My notes indicate that it is a very difficult object to observe.



IC 2631 – Reflection Nebula

IC 2631 is a relative bright reflecting nebula situated 2.5 degrees north-east of gamma Chamaeleontis, resembling a piece of illuminated frosted glass. With averted vision, hazy streaks of brighter nebulosity flow away from the magnitude 9 central star. The haze breaks down towards the western side of the nebula. The whole area around the nebula seems to be bathed in a misty cloud.

The edge-on galaxy **NGC 3620** is situated only 30' further north-east of IC 2631, close to the border of the constellation Carina. Only with averted vision can the thin faint substance of this edge-on galaxy be seen. This extremely faint galaxy appears in an east-west direction, and reveals a spotless surface without any features. A nice curve of faint stars at the southern side of the galaxy, extends into the field of view.

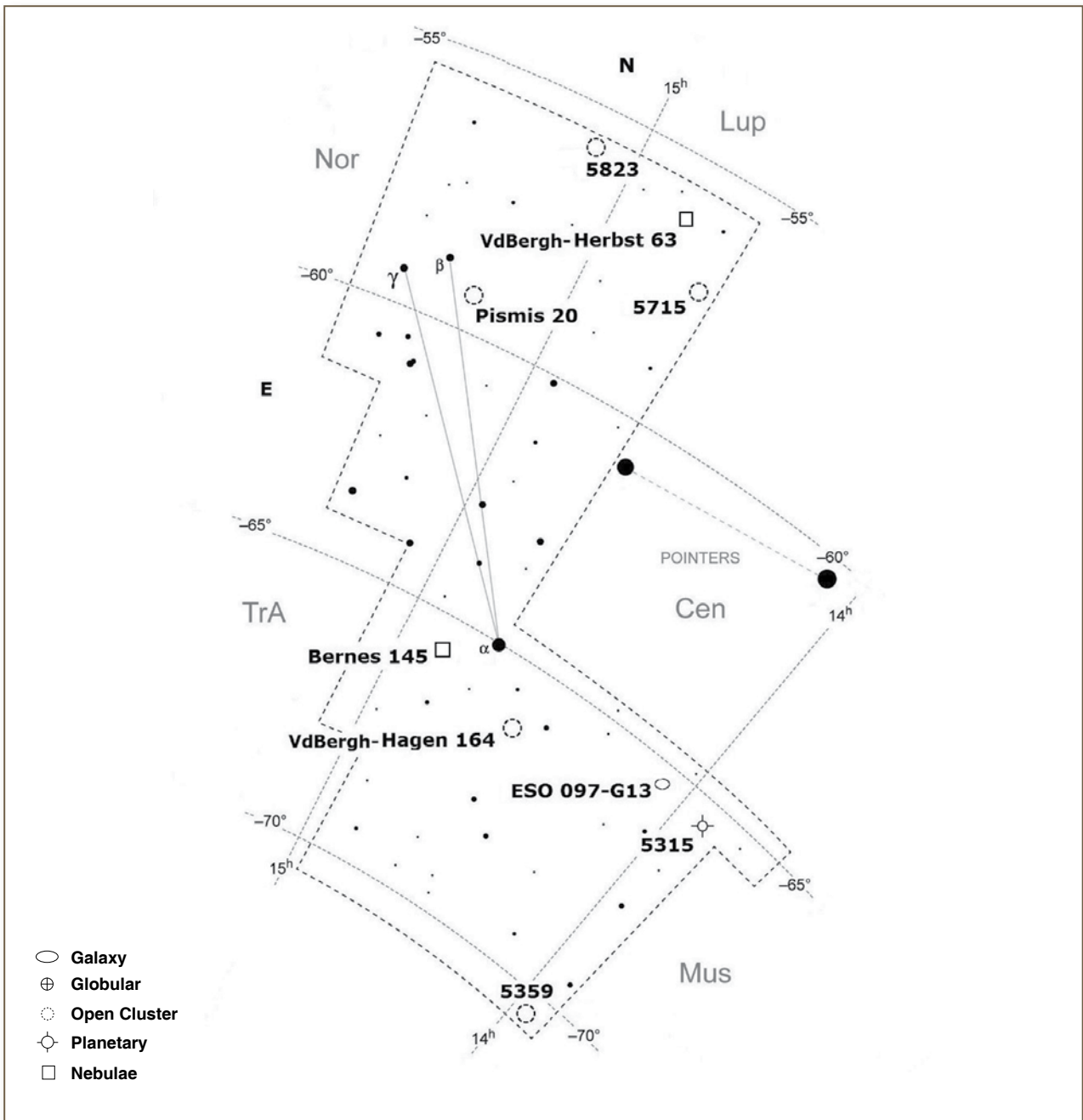


NGC 3620 – Photograph: In-The-Sky

The constellation Chamaeleon is also home to a dark nebula which has been listed as **Sa 156** in Sandqvist's Catalogue of Dark Nebulae, published in 1977. It is a rather large dark patch around 2.5 degrees in size, lying in a roughly north to south direction about 2 degrees east of beta Chamaeleontis. However, be sure to visit a very dark, transparent sky to be able to spot this elusive dark nebula.

We are indeed proud of the name Chamaeleon, whether linked to one of our country's top artists, the little land animal with its natural ability to change its colour and spots, or the renowned constellation of the same name.

OBJECT	TYPE	RA	DEC	MAG	SIZE
MAMAJEK 1	Open Cluster	08h41m.3	-78°57'.8	5.4	8'
STREICHER 21 DSH J0851.0-8009	Asterism	08h51m.0	-80°09'.5	11	22'
ESO 37-01	Globular Cluster	09h20m.9	-77°16'.9	11.4	4'
NGC 2915	Galaxy	09h26m.2	-76°37'.6	12.4	2.4'×1.3'
NGC 3149	Galaxy	10h03m.8	-80°25'.4	12.8	2'×1.9'
NGC 3195	Planetary Nebula	10h09m.5	-80°51'.5	11.6	38"
IC 2631	Reflection Nebula	11h09m.8	-76°36'.7	9	6'×5'
NGC 3620	Galaxy	11h16m.1	-76°13'.4	12.7	2.7'×1.1'
Sa 156	Dark Nebula	12h59m.0	-77°10'.0	-	3°×2°



The constellation of Circinus

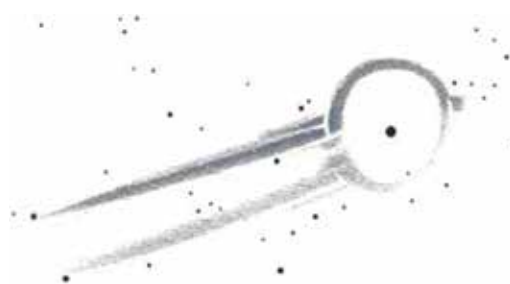


My grandfather's old-fashioned drawing compass dating back to 1944

CIRCINUS

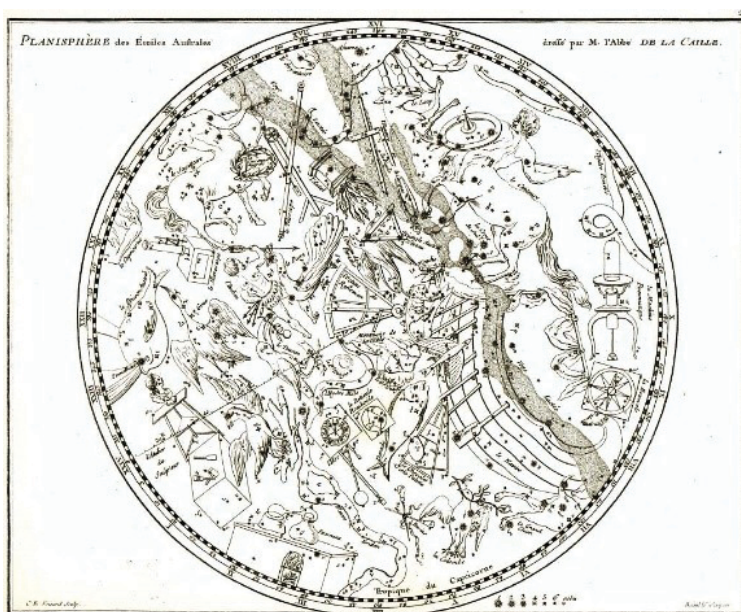
The Handy Tool

While at the Cape of Good Hope in 1752, the astronomer Nicolas Louis de Lacaille created a constellation among the stars, which he named the Drafting Compass – a tool which, in his mind, was handy and essential for building ships that sail the seas to discover new horizons and eventually new land.



“If we think back a few decades, we will recall being introduced to an instrument, used to inscribe circles or arcs. Standard in the school stationery tin were triangles, a protractor and that wobbly compass that tended to draw ellipses rather than circles in our inexperienced hands. A protractor measures angles and as such is also used in the design and draughting industries. Then, one day, the men with the thick lenses invented a special instrument which replaced the protractor on the drawing board and which was, in reality, just a combination of the contents of the stationery tin. Then, a ruler that could rotate through any number of degrees became the next ally to the drawing board. Today measurements are done on the computer and the protractor and the school stationery tin are barely given a thought, having receded into the dim and distant past”. (The late Sous Greyvenstein).

The starry drawing compass is one of the night sky's smallest constellations, with only the constellations Crux, Equuleus and Sagitta covering a smaller area. The constellation is squeezed in between Centaurus to the west, Lupus to the north, Apus on its southern side and Triangulum Australe to the east. The shape of Circinus resembles a long triangle with alpha Circini pointing south-west. The stars beta and gamma Circini complete the shape of the image, approximately 7 degrees north.



Lacaille's map showing his representation of the southern constellations
Photograph: Universe Today

On the northern boundary, the open star cluster **NGC 5823** is nearly bisected by the constellations Circinus and Lupus. It is a really patchy cluster with between 40 and 50 stars fitting into one another at random, almost like a jigsaw puzzle. The inner area reminds me of a rose with stardust circling out in curls and twists. The southern section of the cluster is well rounded off with a semicircle of stars, fainter ones flowing up to the north where it stretches out with a short star string pointing north-west. The western part of the cluster seems slightly busier in terms of starlight. For some amateurs the arrangement of stars in this cluster creates the impression of an exploding firecracker. The double star Hrg 107, named after its discoverer Lawrence Hargrave, is situated 1.5 degrees south-east of NGC 5823. This double star contains a grey to slightly yellow coloured magnitude 8.5 primary and a magnitude 9.1 companion shining in a pure yellow colour.

The nebula, **VAN DEN BERGH-HERBST 63**, situated in the far northern part of the constellation, is only a faint wisp of light seen with averted vision, reflected by the light of the magnitude 10.4-star HD 130079. Sydney van den Bergh and William Herbst compiled in 1875 the Catalogue of Southern Stars embedded in Nebulosity.



NGC 5715 – Photograph: DSS

NGC 5715 is another border hugging open cluster, situated 20' east of the border with Centaurus, in the north-western part of Circinus. This cluster consists of around a dozen stars, noticeably fainter than the surrounding star field. Stars appear in two semi-circular arcs; one in a south-easterly direction and the other in a north-western direction. This inner core reminds of the symbol @ so familiar to electronic mail. Most stars appear to display

the same magnitude, with brighter stars notched into the north-western side of the grouping. Dave Gordon, an astronomy friend, sees the shape of this grouping as a finely woven spider web with encircling strings of stars. The beauty of open clusters lies in the many impressions and ways of describing these star groups.

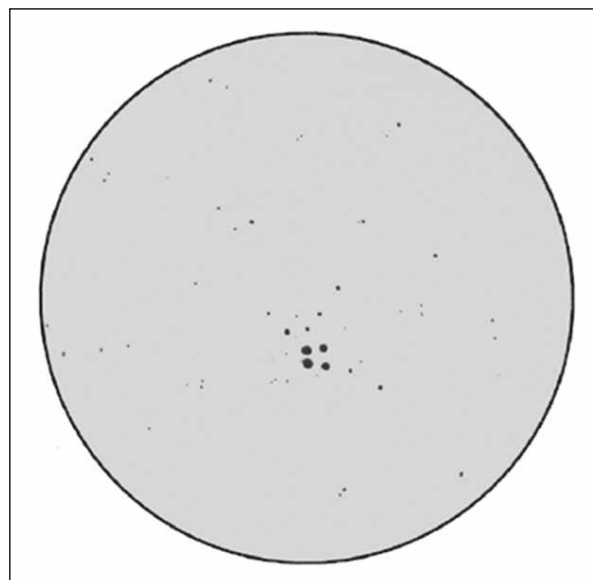
Adjoining beta Circini, 23' to the south-west, is the cluster **PISMIS 20**, surely one of the quietest little groupings. The cluster consists of a few stars between magnitude 8 to 11, with a closely packed square of brighter stars towards the middle area, one particularly yellow in colour. Members flank out on either side from the focal point, with the longest ray pointing in a north-west direction.

Circinus also offers a dark and a reflection nebula in its circle of elusive objects.

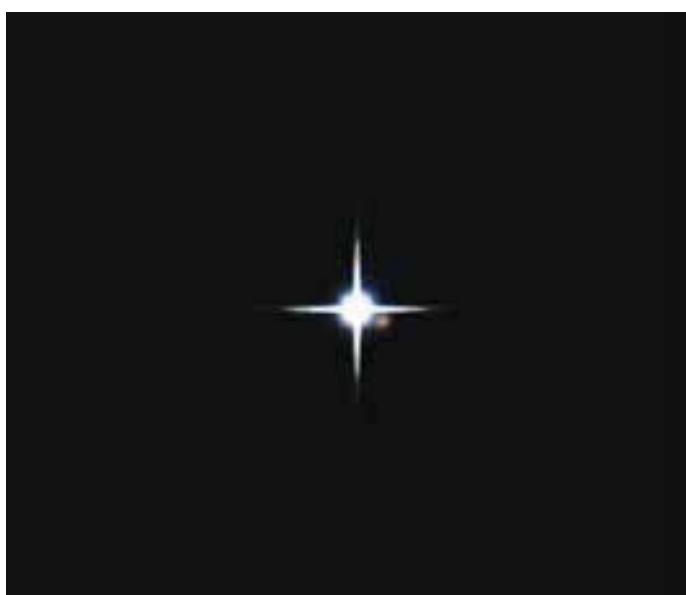
BERNES 145 is located 42' east of alpha Circini and appears as an almost black, oval patch, slightly elongated in a south-east to north-west direction. The Catalogue of Bright Nebulosity's of Opaque Dust Clouds by Claes Bernes, the Swedish astronomer, was compiled in 1971 to determine the physical associations between bright and dark nebulae.

Situated further south **VAN DEN BERGH-HAGEN 164** became debatable in 1968 because the cluster is slightly miss-plotted in relation to the indicated position. However, a cascade of eight more or less magnitude 7 blue-white stars can be seen running in a north-south direction for almost 30' just east of the indicated position. Sydney van den Bergh and Gretchen Luft Hagen, born as Gretchen Luft in 1942, who was married to John Peter Hagen, compiled a list of 262 objects in 1975.

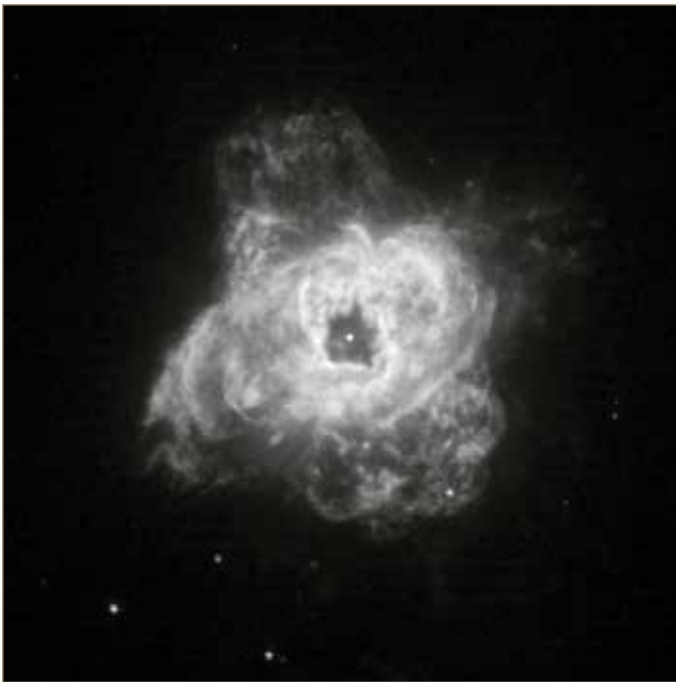
The star alpha Circini proudly occupies the place of honour at the apex of the old-fashioned compass constellation. With a white primary and golden-coloured companion, it is one of the most beautiful contrasting double stars in the southern starry skies.



PISMIS 20 – Open Cluster



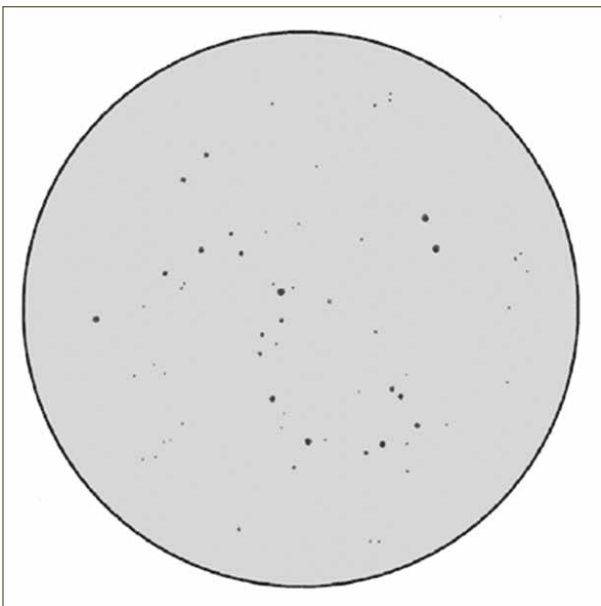
alpha Circini – Photograph: Lucas Ferreira



NGC 5315 – Hubble Heritage

Nearly jumping the constellation fence is the planetary nebula **NGC 5315**, situated just 26' east of the constellation Musca. It is an extremely small planetary nebula, hardly visible. Careful observation reveals the planetary as a frosted point of light in a soft, misty blue to grey wrapping. Alternating between direct and averted vision, it produced a blinking on-off effect, which eventually enabled me to spot this faint speck of starlight. There are several other planetary nebulae that have the right magnitude central star in comparison with the nebula's overall brightness to show

this effect. The most famous one is NGC 6826 better known as the Blinking Planetary in the constellation Cygnus.



NGC 5359 – Open Cluster

Running in circles around the heavenly drawing compass, we find the open cluster **NGC 5359**, which is situated 15' north and dangerously close to the Apus constellation border. It is a lovely grouping with stars in a roundabout snake formation. The group contains about 22 stars and appears to me rather like a little seahorse in shape, displaying a curly tail on the western side, which really does justice to the little marine animal.

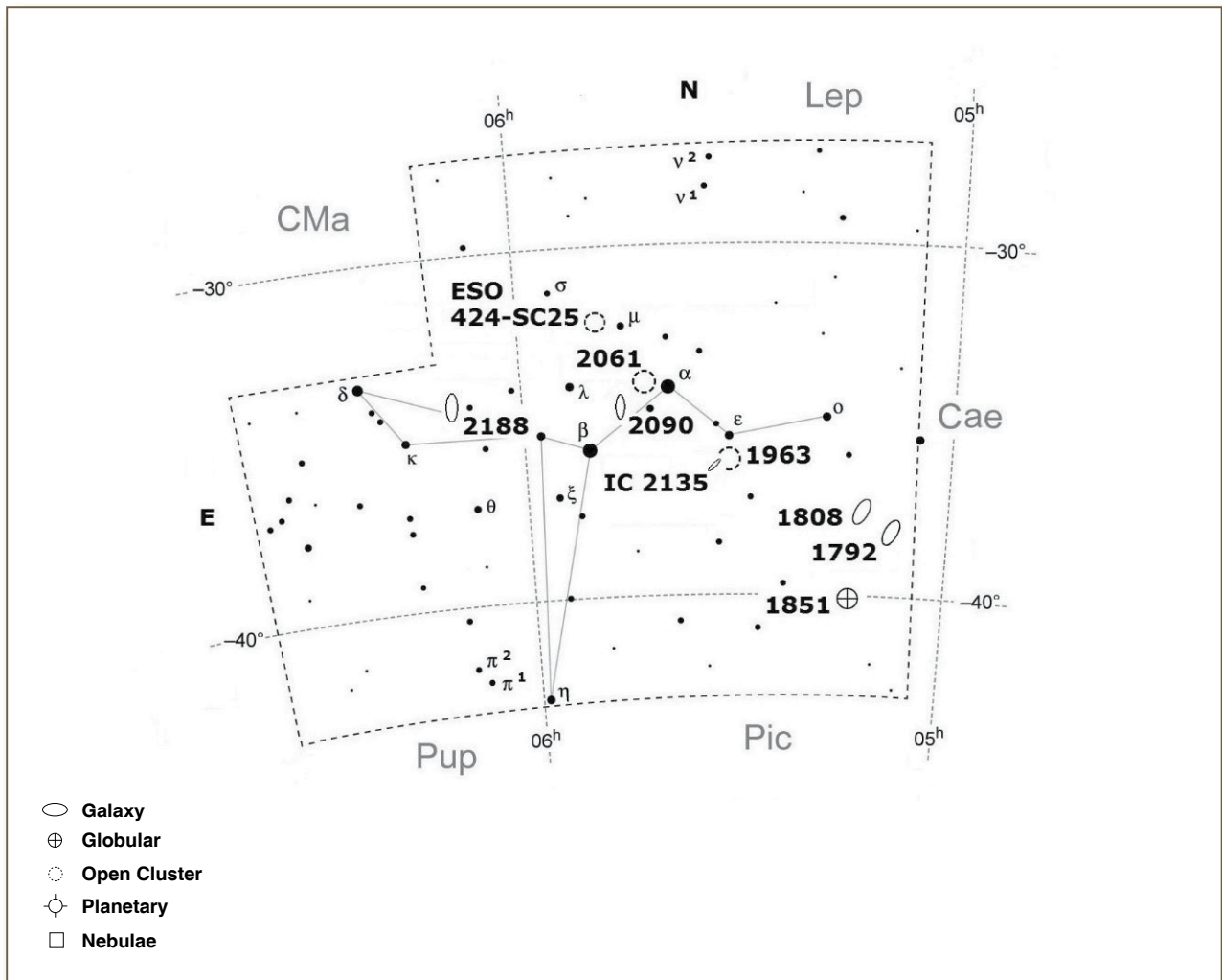
John Herschel described NGC 5359 in 1835 as a coarsely scattered cluster of class VIII. Herschel used a system for

fainter stars which is not the same as the one we use today, and the then magnitude 11 is probably nearer to the present magnitude 10 or maybe slightly brighter. His scale even goes down to 20 magnitude!

Only 3 degrees west of alpha Circini we find arguably one of the most interesting objects in the starry skies. The Circinus Galaxy was discovered as recently as 1974, when Ken Freeman noticed this large spiral galaxy on a red-light photographic plate taken with the Uppsala Schmidt telescope at Mount Stromlo in Australia. It had remained hidden for so long because it is partly obscured by the galactic plane. The galaxy is now listed formally as **ESO 097-G13**. The distance is about the same as the Centaurus Galaxy group, although it is not a member of that group, but for now the nearest Seyfert galaxy discovered.

Take a wide, dancing sweep through the constellation Circinus to the beat of the drawing compass and observe its wonderful objects to a fine edge.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5315	Planetary Nebula	13h53m.9	-66°30'.8	9.8	13"
NGC 5359	Open Cluster	13h59m.8	-70°23'.5	10	8'
ESO 097-G13	Galaxy	14h13m.2	-65°20'.0	10.6	6.9'×3'
NGC 5715	Open Cluster	14h43m.7	-57°34'.6	9.8	7'
VAN DEN BERGH-HAGEN 164	Open Cluster	14h44m.1	-66°24'.0	7	29'
BERNES 145	Dark Nebula	14h48m.6	-65°15'.0	-	12'×5'
VAN DEN BERGH-HERBST 63	Nebula	14h49m.4	-56°14'.0	10.4	1.5'×1.5'
NGC 5823	Open Cluster	15h05m.7	-55°36'.2	7.9	10'
PISMIS 20	Open Cluster	15h15m.4	-59°04'.0	7.8	4.5'



The constellation of Columba



Feral Dove *Columba Livia*
Photograph: Joe Grosel



Speckled Pigeon *Columba Guinea*
Photograph: Joe Grosel

COLUMBA

The Flying Star-Dove

Columba is a small southern constellation and one that had many tales woven around it. The original name for this constellation was Columba Noae or Noah's Dove, with the starry bird appearing to be flying just off the compass of Jason's ship, the combined constellations of Vela, Carina, Puppis and Pyxis. The constellation appeared correctly on Bayer's plate but was formally originated by Petrus Plancius in 1592. According to ancient tales the starry dove was sent out by Jason to search for dry land in the hope of bringing back the branch and leaf of an olive tree.



If we look at earthly doves and pigeons, there are quite a variety of different species all over the world. The million-dollar question is which one inspired Bayer and the French astronomer Royer to name the constellation Columba. I would guess the most likely would be the Speckled Pigeon Columba Guinea, known for its bright red eyes and speckled feathers. Then there is our plain garden dove, the Feral Dove Columba Livia or perhaps the Cape Turtle Dove. It is believed that the Turtle Dove was once a tamed bird originally from North Africa and Europe (*Newman's Birds of South Africa*). Or to speculate further: could it perhaps have been the so-called laughing dove that sings its storybook songs of love. Or wait a minute ... our starry Columba could possibly be named after the so-called carrier pigeon, used to convey mail, bringing good hope.

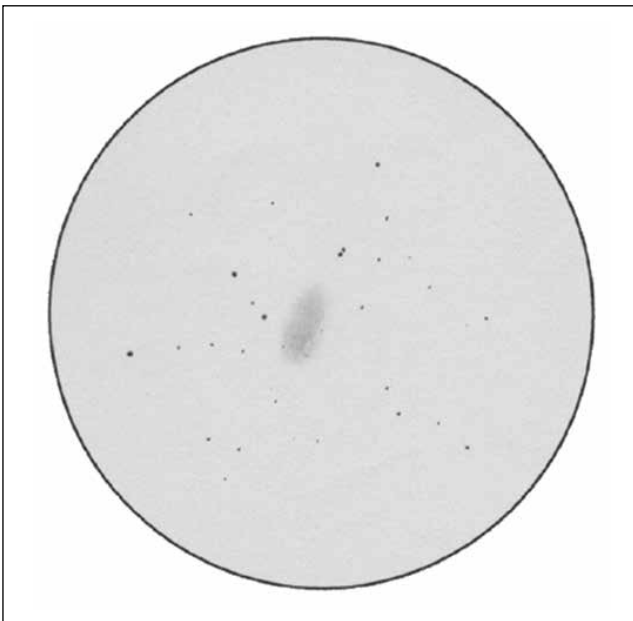
Among the feathers of Columba can be seen one of the most beautiful deep sky objects, **NGC 1851**, a rich globular cluster which is certainly not shy in displaying its outstanding qualities. Modern constellation reform moved NGC 1851 from the constellation Caelum into Columba. NGC 1851 is a large, compact and bright globular cluster situated in the far south-western part of the constellation.



NGC 1851 – Photograph: Lucas Ferreira

The focus of NGC 1851 hosts a very compact, small, hazy, unresolved core that gives the viewer the feeling of looking through frosted glass. The stars in this beautiful globular cluster, also known as Bennett 32, extend unusually far into the field of view. A soft halo expands further out from the core, covering about two-thirds of the whole. A multitude of faint stars burst outwards and display splashes of faint star strings at random. One such string cuts through the southern edge of the globular. This globular reminded me of a smaller version of the famous globular cluster NGC 104 situated in the constellation Tucana. Australian friend and astronomy working partner Jenni Kay has observed the globular through her 8×50 binoculars and sees it as a very bright, large, round glow with a slightly brighter compact core. According to Steve Coe, using averted vision makes this globular cluster appear much larger. Steve Gottlieb's notes indicate that a good deal of resolution is evident in this globular, brightens evenly and then near centre steeply to an almost stellar pip.

The constellation is not abundantly endowed with deep sky objects; most of them are fairly faint. However, a thorough search has revealed some very special objects that have produced some unexpected surprises.



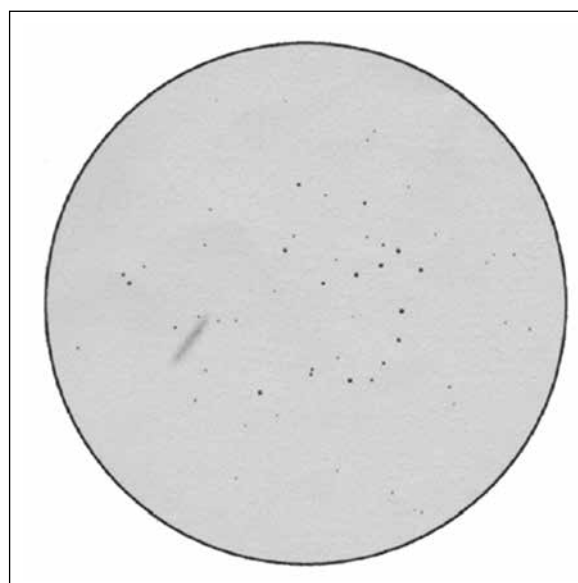
NGC 1792 – Galaxy

The galaxy **NGC 1792**, also known as Bennett 29, is situated further up against the western boundary with Caelum, about halfway between NGC 1851 and the double star gamma Caeli located on the imaginary line separating the two constellations. NGC 1792 appears as a beautiful oval glow, elongated in a north-west to south-east direction and seen quite well against an outstanding star field.

NGC 1792 displays an even surface brightness with a soft, woolly outer edge which at higher magnification appears extended. The northern edge is slightly hazier with a faint double star on the edge. This cigar-shaped galaxy is a close neighbor of NGC 1808 that is situated 36' to the north-east.

NGC 1808 is an outstandingly bright, barred spiral galaxy in a north-west to south-east direction, with a brightness that is uniform across the surface. Higher magnification reveals a somewhat rougher texture with mottled areas and a few brighter patches across its surface. With careful observation the nucleus brightens rapidly to a small, compact light-point. With careful observation there also appears to be a flimsy outer envelope around the galaxy. South of the galaxy is a chain of about magnitude 10 stars in a line almost east to west. The galaxy is, in fact, a somewhat abnormal example, displaying nuclear hot spots and starburst activity rather reminiscent of the galaxy M82 in the constellation Ursa Major. NGC 1808 is included in the Arp and Madore's Catalogue of Southern Peculiar Galaxies and Associations.

The magnitude 3.8 epsilon Columbae, could possibly be said to indicate the beak of the heavenly dove, situated just north of the cluster **NGC 1963**. It is an outstanding group with a slightly confusing identification. John Herschel, who discovered the object, described it as a cluster of various magnitude stars, arranged almost like a bow. Brighter stars represent the bow with another few distinct stars forming the tip of the arrow point. The galaxy **IC 2135** is the indicated controversial object, situated on the eastern tip of the star group. This galaxy displays a small soft ray of light in a north-west to south-east direction.

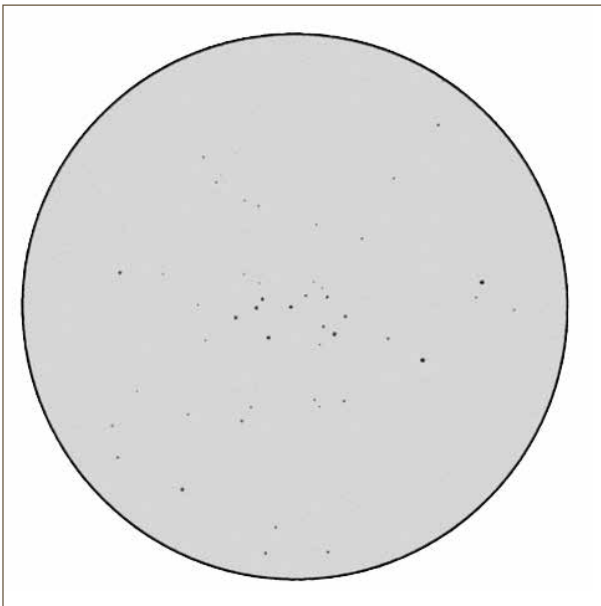


NGC 1963 – Open Cluster and
Galaxy IC 2135

It is not known who originally described IC 2135 as NGC 1963, but it was probably the PGC (The Principal Galaxy Catalogue). The PGC catalogue noted an object labelled PGC 17433 also as IC 2135, IC 2136, NGC 1963 and ESO 363-G7 to be the same object. Initially, the thought was that such an object might have formed part of the Revised NGC Catalogue. The coordinates are roughly the same, but NGC 1963 is obviously a cluster according to the description given by John Herschel. The first ESO/Uppsala (European Southern Observatory) survey atlas indicated NGC 1963 to be a cluster. The Reference Catalogue of Galaxies did not list NGC 1963 at all. The Second Reference Catalogue noted IC 2135, IC 2136 and ESO 363-G7 as the same object, according to the astronomer Lewis Swift's inscription. Swift, who was well acquainted with Herschel's work, was looking for new objects that Herschel had overlooked. Swift therefore would have known NGC 1963 as a cluster and not a galaxy. Whatever the case may be, it is inappropriate to allocate the number NGC 1963 to the galaxy, as it is obvious what Herschel saw and described.

The brilliant blue-white magnitude 2.6 alpha Columbae, which could be seen as the eye of our starry dove, is situated just 38' to the west of the open cluster **NGC 2061**. The cluster, listed as a doubtful object, displays a loose irregular grouping of stars with the eastern side less busy with starlight. The brightest magnitude 7.2 star is situated on the far northern edge of the grouping, which also has a magnitude 11.6 companion towards the west.

Another relatively faint galaxy, **NGC 2090**, is situated 50' further east of NGC 2061 and displays an extended shape in a north-south direction with a barely brighter centre. Although faint, it can be detected with careful observation, dark skies and high magnification.



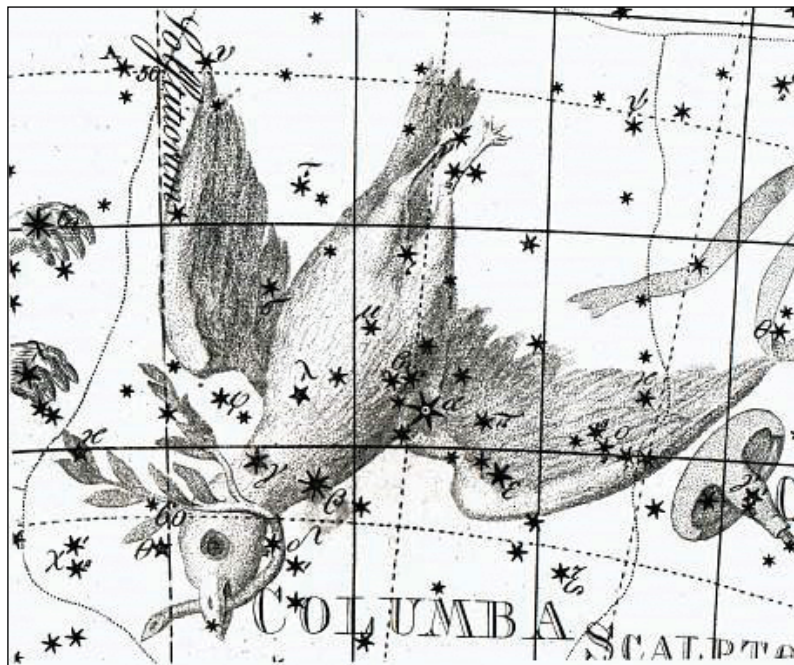
ESO 424-SC25 – Open Cluster

The cluster **ESO 424-SC25** is a lovely group of approximately ten stars ranging from magnitude 10 to 11. It is a very pleasing grouping showing a true arrowhead pointing east with a sling of faint stars curling away to the west. What is special about this group is that most of the stars display a yellow to orange colour. The brightest star situated at the south-west end of the group is magnitude 9.4.

The galaxy **NGC 2188** appears to be riding on the back of the starry dove 2.5 degrees south-west of magnitude 3.8 delta Columbae which could be seen as the fan-tail of the constellation. The galaxy displays a beautiful elongated shape in a north-south direction. The southern edge looks wider and more defined, whereas the northern part becomes fainter and thinner. The nucleus of this galaxy is obscured in the hazy surface, making it difficult to see. In some ways this object reminds me of a very faint comet, and deep photographs show a little kink towards the southern tip of the galaxy.

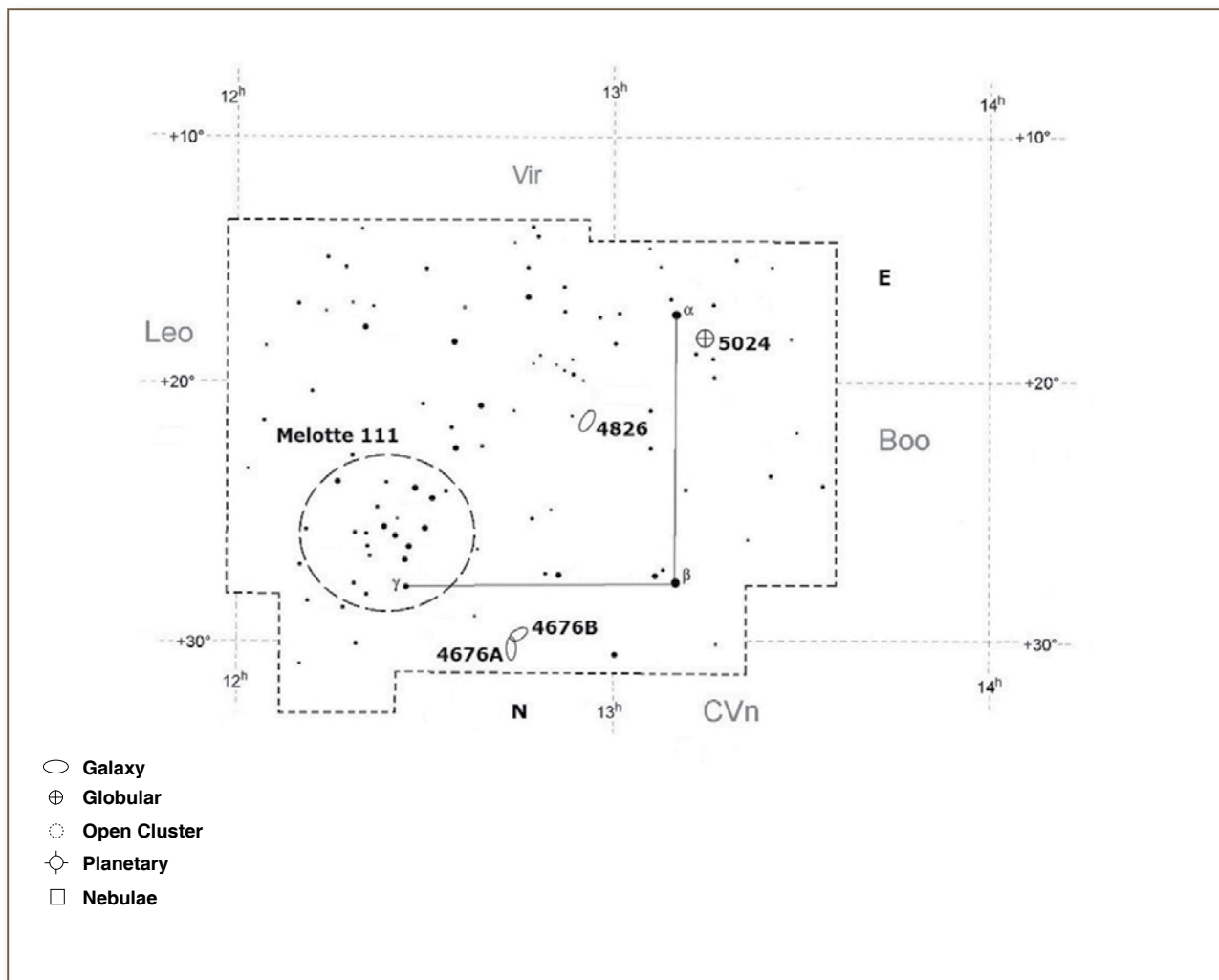
The ordinary dove is no stranger to us as a visitor to our gardens. Little wonder, then, that an image of the common dove has found a place among the stars.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1792	Galaxy	05h05m.2	-37°58'.8	9.8	5.5'×2.5'
NGC 1808	Galaxy	05h07m.7	-37°30'.9	9.9	5.2'×2.3'
NGC 1851	Globular Cluster	05h14m.1	-40°02'.8	7.2	11'
NGC 1963	Open Cluster	05h32m.1	-36°22'.8	11	14'
IC 2135	Galaxy	05h33m.2	-36°23'.9	13	2.8'×0.6'
NGC 2061	Open Cluster	05h44m.1	-33°56'.1	11	10'
NGC 2090	Galaxy	05h47m.1	-34°14'.3	11	4.5'×2.3'
ESO 424-SC25	Open Cluster	05h49m.8	-32°28'.0	10.5	8'
NGC 2188	Galaxy	06h10m.1	-34°06'.7	11.6	5.5'×1'



Uranographia of Johann Bode 1801

Credit: Ian Ridpath



The constellation of Coma Berenices

COMA BERENICES

Ariadne's Beautiful locks of Hair

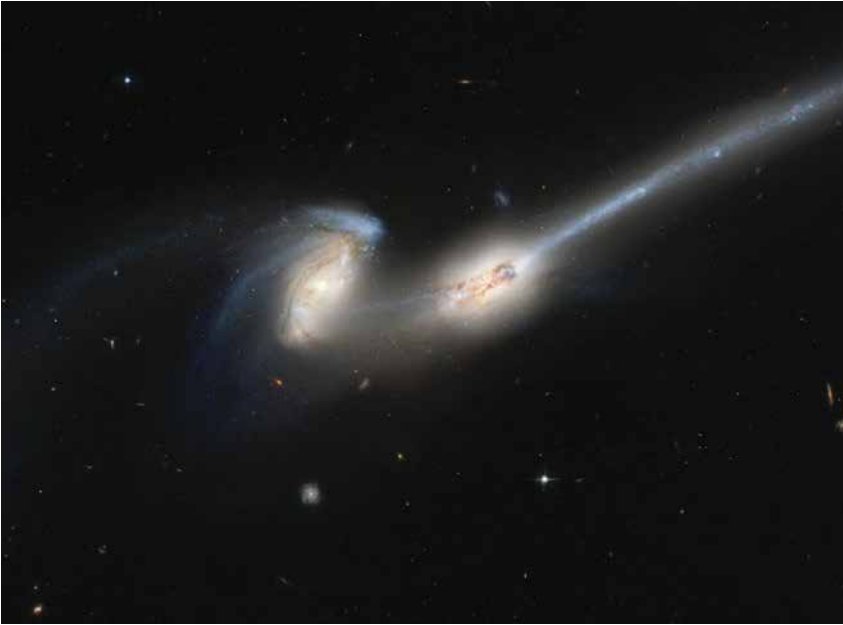
The constellations Coma Berenices and Corona Borealis are two different constellations, but when one of them comes to mind, so does the other. These two constellations represent the lovely maiden with the beautiful hair – Coma Berenices with the crown Corona Borealis on her head. Coma Berenices is commonly referred to as Berenice's Hair, but it was first called Ariadne's Hair, as in Eratosthenes' description of the constellation. Berenice of Cyrene was the wife of Ptolemy. The ancient city of Berenice, named after the Queen, still exists in Libya, but with its name transmuted into Benghazi.



The constellation is well known for the naked-eye open cluster **MELOTTE 111**, also known as the Coma Star Cluster, which is relatively close to us, just 290 light-years away. Containing more than 200 stars, Melotte 111 is more than a handful, with stars brighter than magnitude 8. This large outstanding cluster spreads out southward from the magnitude 4.4 gamma Comae Berenices, which is not a member of the group. The cluster can be appreciated through binoculars and is clearly visible against a dark transparent night sky.



MELOTTE 111 – Photograph: SEDS



NGC 4676A and NGC 4676B – Photograph: Hubble

The best example of a colliding pair of galaxies, **NGC 4676A** and its companion **NGC 4676B**, is situated half a degree from the border line with the constellation Canes Venatici. The pair are popularly known as The Mice, so named by the Russian astronomer Vorontsov-Velyaminov. The two spiral galaxies, about 280 million light-years away, are ripping each other apart and

possibly also a part of the Coma Cluster of Galaxies. Only a Hubble picture could capture the beauty of the two bodies, showing each leaving a long tail of gas and stars behind, suggesting a pair of mice at play.



NGC 4826 – M64 – Photograph: NASA

A much easier task is to explore **NGC 4826**, also known as Messier 64, which is situated 5 degrees north-west of alpha Comae Berenices, perhaps better known by its common name, the Black Eye galaxy. It is easily seen through an amateur telescope and displays its bright eye-like appearance with a shade of black on the southern rim. It brightens up rapidly towards the nucleus and is arguably one of the most impressive deep-sky objects. The Black Eye galaxy was discovered by Edward Pigott in March 1779, and independently by Johann Elert Bode in April of the same year. Charles Messier observed and documented the galaxy in 1780.

If you are brave enough, try, in this galaxy-packed part of the sky, to observe NGC 4206, NGC 4216 and NGC 4222, the finest trio of edge-on spiral galaxies in the entire sky. They are situated in the far north-western part close to the constellation Virgo.

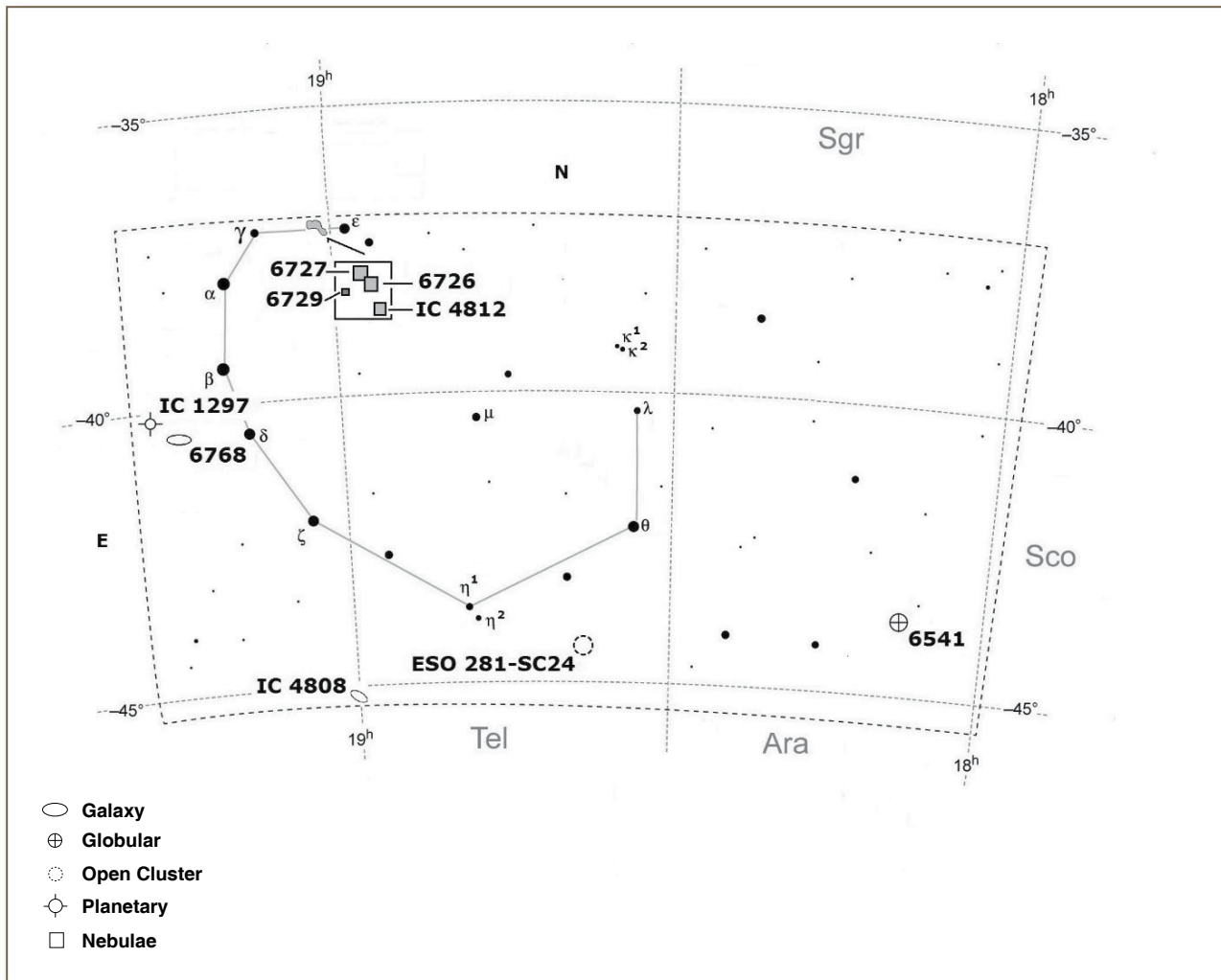
Finding a globular cluster in galaxy world is a welcome surprise with **NGC 5024**, better known as Messier 53, situated only a degree north-east of alpha Comae Berenices. It displays a bright globe of frosty light with a very dense core. It is a beautiful globular with faint stars resolved on the outer edges, an object to admire.



NGC 5024 – M53 – Photograph: Universe Today

Let your hair hang down and observe the golden locks of beautiful deep sky objects in Coma Berenices.

OBJECT	TYPE	RA	DEC	MAG	SIZE
MELOTTE 111	Open Cluster	12h25m.6	+26°06'.8	5	275'
NGC 4676A	Galaxies	12h46m.1	+30°43'.8	13	2'×0.6'
NGC 4676B		12h46m.2	+30°43'.3	13.2	1.7'×0.7'
NGC 4826 Messier 64	Galaxy	12h56m.7	+21°41'.3	8.5	9.2'×4.6'
NGC 5024 Messier 53	Globular Cluster	13h12m.9	+18°09'.3	7.5	12.6'



The constellation of Corona Australis



My aunt Joey, my mother and flower girl on her wedding day in 1945 wearing her crown with the utmost flair

CORONA AUSTRALIS

The Southern Queen's Crown

Corona Australis is a constellation that is not only very special in terms of its shape, but also deserves to be treated with the necessary respect. The constellation, which truly does resemble a crown of glory, is located just off the south-western edge of Sagittarius; sometimes described as the "Queen's teapot in star form". When Corona Australis appears to be suspended from the Milky Way during the southern winter, I cannot help thinking about the English Royalty. The starry heavens possess an abundance of sparkling jewels and Corona Australis is truly a jewelry box par excellence. Nor have the northern skies been neglected - they boast their own crown, which, of course, we know as Corona Borealis.



Corona Australis was included as one of the original 48 constellations in the Ptolemy catalogue. German speakers call the constellation Südliche Krone, in contrast with the Chinese, who see the stars as forming a tortoise. Shaped like a half-moon, it has also been referred to as a woman's tent, or travelling apartment, and even an ostrich nest (*Star Names: Their Lore and Meaning* – Richard Allen). Be that as it may, this constellation is very special. Let's explore this constellation and its sparkling jewels one by one.

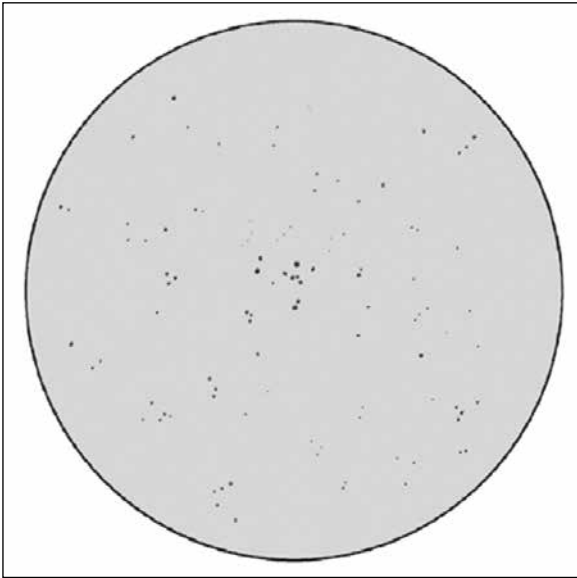
In the furthest south-western part of the constellation, we find the exceptional globular cluster **NGC 6541**. It is a beautiful object, packed with various-magnitude stars which grow into a very condensed bright core. The outskirts of the globular cluster reveal pinpoint shimmering gem-stars spraying away into the field of view. The stars in the southern part seem denser in comparison with those in the north-west, which gives an impression of flowing away. With care and higher magnification, dark lanes become visible around the edges between the short star strings.



NGC 6541 – Photograph: phys.ttu.edu

Averted vision does justice to NGC 6541, which is surrounded by a brilliant, busy star field. Someone has very appropriately referred to the globular cluster as a spider's cocoon nest. The conspicuous magnitude 8 red variable star V712 Coronae Australis is situated only 15' towards the north-west of this outstanding object. NGC 6541 is the only deep sky object found by Niccolò Cacciadore in Palermo; he saw it on 19 March 1826 with a 3-inch refractor and was discovered 11 weeks earlier than Dunlop's observation.

The southern starry crown has, as the focal precious stone, the double stars eta Coronae Australis. These two brilliant-white suns magnitude 5.1 and magnitude 5.5 can be seen with the naked eye in dark sky conditions.



ESO 281-SC24 – Open Cluster

The open cluster **ESO 281-SC24** is situated 1.6 degrees south-west of eta Coronae Australis. The uniqueness of this grouping never fails to amaze me – a nice, delightful star group, with only a few stars as the focus, in a roughly north-east to south-west direction. The easily visible dull yellow magnitude 7.3-star HD 172144 is situated just to the east end of the group. Fainter stars can be glimpsed amongst the brighter ones. In a wide field of view this grouping stands out well.



IC 4808 – Photograph: In-The-Sky

Corona Australis is situated reasonably close to the widest part of the Milky Way, where galaxies are not commonly found. Nevertheless, our Crown constellation does not disappoint, as the galaxy **IC 4808** is situated on the border between Corona Australis and Telescopium. It probably has an identity crisis about which constellation it belongs to. The galaxy appears as a soft oval in a north-east to south-west direction and grows slightly brighter towards the middle. A few stars in a V-shape are situated to the south-west.

A mere 1.5 degrees east of shiny yellow magnitude 4 beta Coronae Australis, the galaxy **NGC 6768** and its companion can be seen along the border with Sagittarius. With averted vision, the object is just visible as a faint haze. Photographs reveal a small galaxy in an east-west oval extension that fits comfortably close to the south-western edge of the larger galaxy. It turns out to be two merging galaxies, listed together as NGC 6768.

Barely 35' north of the galaxies the planetary nebula **IC 1297** can be found, located within 15' of the southern Sagittarius border. The soft haze could be compared with the glow of a frosted, pale blue opal. The nebula appears to have a diffused edge, but is not very difficult to spot against the rather faint starry field. The use of an oxygen (O-III) filter will bring this planetary nebula more to the fore.

In the north-west of the constellation we find the beautiful double star kappa Coronae Australis, which John Herschel discovered in 1836. The primary with magnitude 5.9 appears slightly blue-white when compared to the companion magnitude 6.6, which appears yellow-white in color. The first known observations date back to 1836, when the double star had a separation of 30" and a position angle (PA) of 360°. In 2008 the separation was noted as 21.4" with a position angle (PA) of 359°. A clear string of five magnitude 10 stars curves away into the western field of view.

Precious stones are created and nurtured deep inside the earth's crust. When these gem stones are mined and polished, their preciousness and sparkling appearance astound us. My observatory is situated in the mineral-rich northern landscape of South Africa. Believe me, during my nocturnal exploration of the heavens, I not only look up at the wonderful starry skies but also continually scratch around in the stone-strewn veld in search of shiny stones. Crowns, which are so well-endowed with precious stones, are probably among the most valuable and beautiful items.

However, pity the poor regent who has to carry a crown on his or her head! I am thinking now of the queen of England's Imperial State Crown, weighing almost 2.2 kilogram, which she has to wear during her ceremonial speeches to the assembled House of Parliament. However, nowhere near so heavy-going is the exploration of our own sparkling crown constellation, Corona Australis, with its splendid sparkling deep sky objects.

The most exceptional objects contained in this half-moon-shaped garland of stars are situated just 30' east of epsilon Coronae Australis. My notes refer to this area as a region with obscured diffuse nebulosity, beaded with various-magnitude star gems.



It is one of the most outstanding star fields I have ever seen. Reflecting nebulosity folding like a soft, hazy eiderdown around the objects **NGC 6726** and **NGC 6727**. The brighter southern patch NGC 6726 is a variable reflection nebula containing a super-white magnitude 7 star, with the position of NGC 6727 being indicated by a magnitude 9.5-star.

A challenge, however, is to pin down the tiny variable nebula **NGC 6729** hanging in the nebulosity just 5' east of this large reflecting veil of haziness. The haziness folds around the star R Coronae Australis, which varies between magnitude 9.7 and 13.5 in brightness.

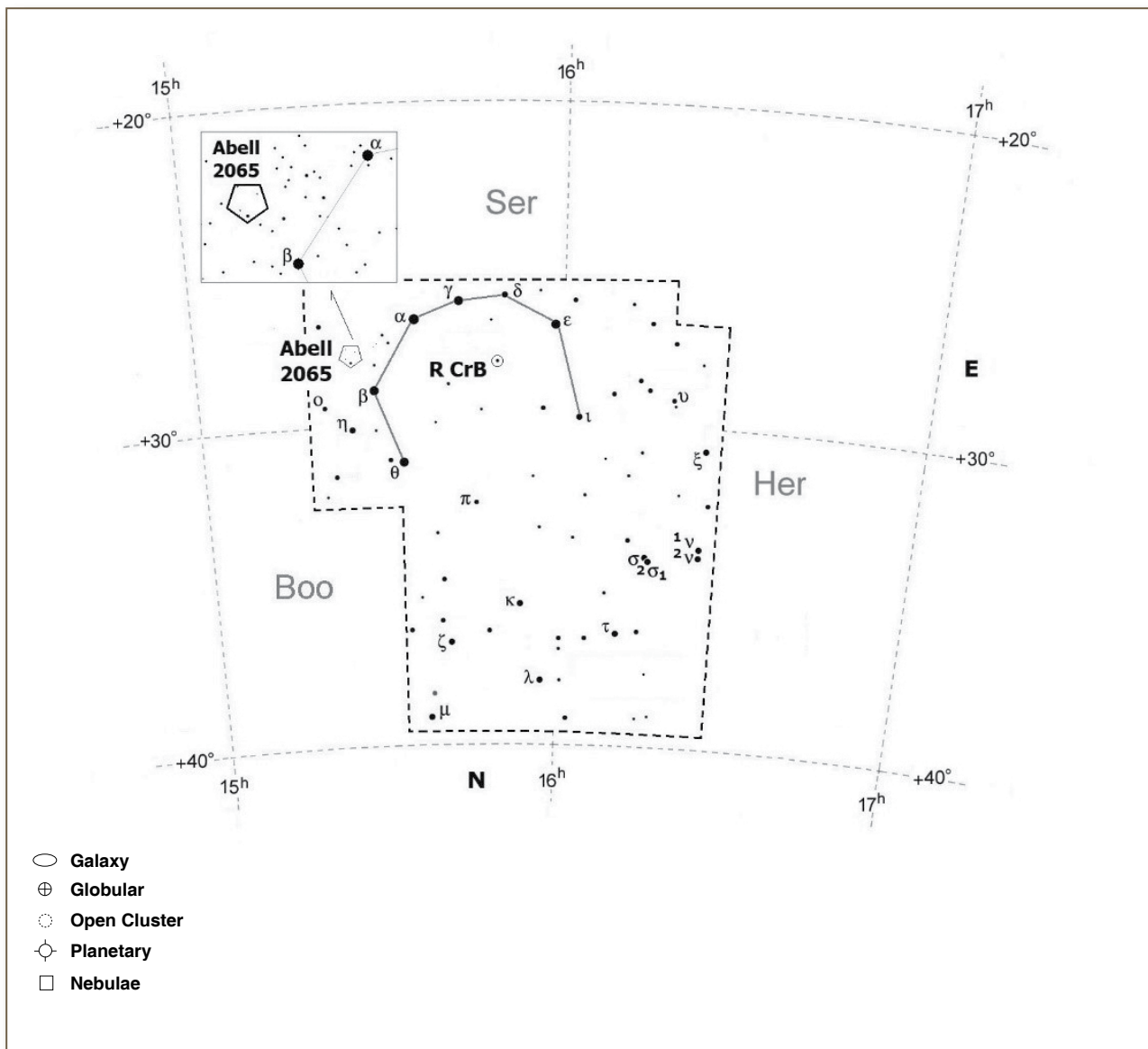
The nebulosity flows down 12' southwards to **IC 4812**,

appearing as a twin star covered in soft mistiness. One can almost smell the moisture, as if in a rainy forest. NGC 6726 ext. – Photograph: Dieter Willasch

Interestingly all three nebulae were overlooked by Herschel and Dunlop. Julius Schmidt discovered them on 15 June 1861 at Athens with a 6.2-inch refractor.

When you look up into the starry skies at our southern Crown during the winter months, pretend that you are the king or queen it belongs to, and discover and revel in its rich precious gems.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6541	Globular Cluster	18h08m.0	-43°42'.0	6.1	13'
ESO 281-SC24	Open Cluster	18h40m.0	-44°12'.0	9.5	6'
IC 4812	Nebula	19h01m.1	-37°04'.0	6.5	10'
NGC 6726	Reflecting Nebula	19h01m.6	-36°53'.4	7.2	4'
NGC 6727	Reflecting Nebula	19h01m.7	-36°52'.7	9	4'
NGC 6729	Variable Nebula	19h01m.9	-36°56'.6	9.7	1'
IC 4808	Galaxy	19h02m.1	-45°18'.9	12.8	2'×0.8'
NGC 6768	Galaxy	19h16m.5	-40°11'.0	11.2	1.2'×1.1'
IC 1297	Planetary Nebula	19h17m.4	-39°36'.8	10.7	7"



The constellation of Corona Borealis

OBJECT	TYPE	RA	DEC	MAG	SIZE
Abell 2065	Galaxies	15h22m.7	+27°42'.4	15-16+	14.7'
R Coronae Borealis	Variable Star	15h48m.6	+28°09'.3	5.7-14.8	*

The beautiful maiden with the crown on her head hides away her jewels but it is for us to search them out.

CORONA BOREALIS

Ariadne's Crown

The crown on Ariadne's head is honoured with a place in the starry night sky with more than one name. Corona Borealis is the constellation which has arguably had the most names since antiquity. Ariadne was the daughter of Minos, King of Crete. The names given to the constellation have therefore all been aimed at honouring her – Ariadnaea Corona, Corona Ariadnae, Corona Ariadnes, Cressa Corona, Corona Gnosida, Corona Cretica, and also Ariadne's Tiara.

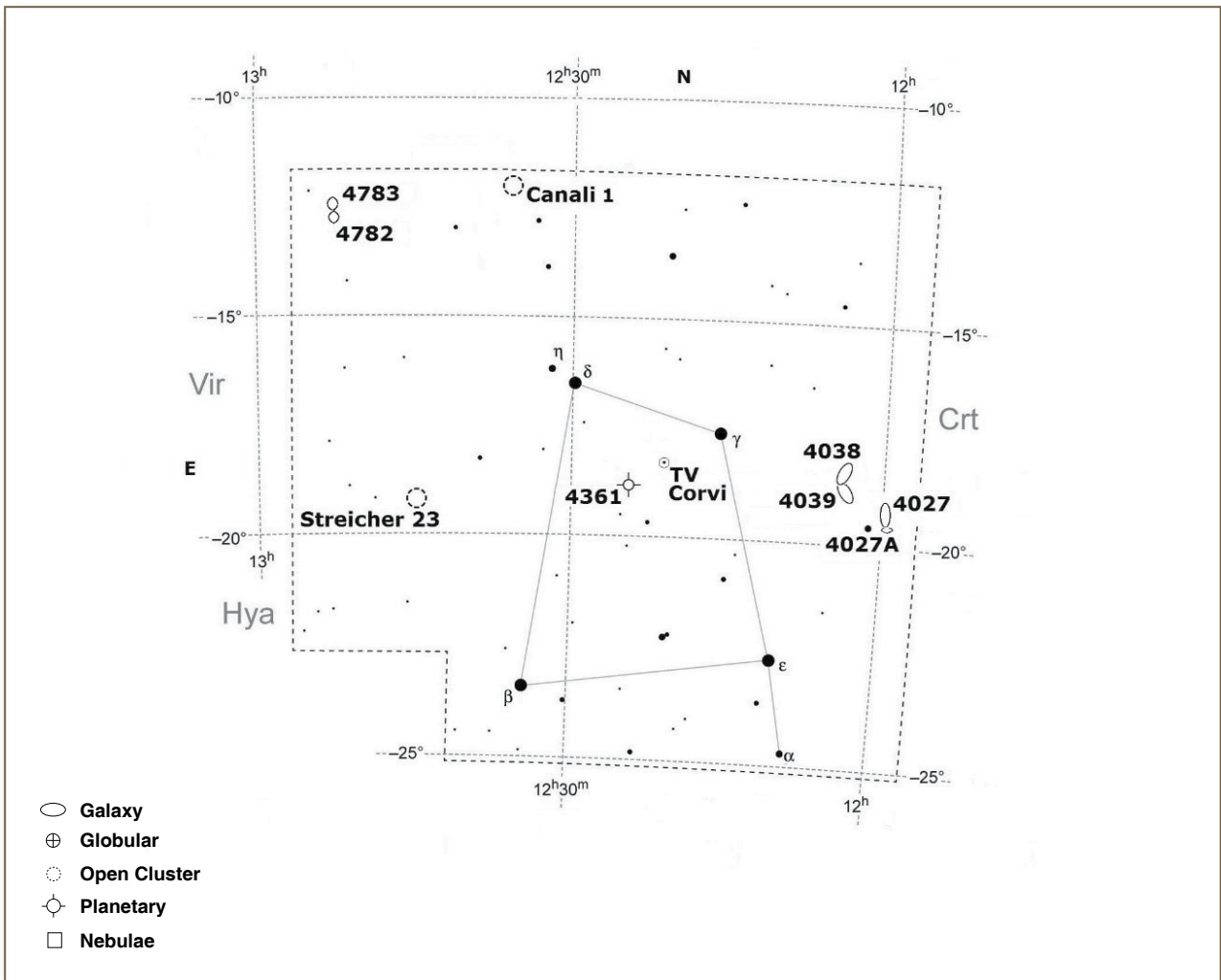


The jewels in the crown are the extremely faint galaxies **ABELL 2065**, better known as the Corona Borealis Cluster of Galaxies. Much has been written about this group, the observing of which requires an extremely clear, dark night sky and a fairly large telescope in order to identify some of them.

This massive group, which holds about 400 galaxies, is about one billion light-years away from us. The brightest galaxy is only approximately magnitude 16, making visible observation by an amateur almost impossible, although a few amateurs have claimed that they were successful in observing a few of them.

Abell 2065 is situated only 1.5 degrees south-west of beta Coronae Borealis. Try to observe it, despite the apparent difficulties – fortune does not favour the unbrave! Given the northern location where I live, my best shot at observation was in 2011 with the purest, clearest, driest night sky and with a naked-eye vision of nearly 7. The starting point was the magnitude 7.3 magnitude star HD 137003. Only 4' west two out of focus pinhead-size points could be spotted with averted vision. Afterwards, I wondered whether I had actually seen them, like phantoms in the night. Some mapwork confirmed that these were the galaxies LEDA 93832 and LEDA 93833. The constellation is home to a staggering number of galaxies, which topped the whole experience of an extremely difficult observation.

An exciting star, and one of the most special ones to be found, is situated inside the half-moon crown just to the north-west of delta and epsilon Coronae Borealis. The star R Coronae Borealis (R CrB) is an eruptive variable low-mass yellow supergiant that varies in luminosity in two modes: one low-amplitude pulsation (a few tenths of a magnitude) and one irregular, unpredictably sudden fading. This very rare kind of prototype star was discovered by the English amateur astronomer Edward Pigott in 1795, who first observed the enigmatic fading of the star then. It normally shines at approximately magnitude 5.7 but at intervals of several months to many years' fades to as faint as magnitude 14.8.



The constellation of Corvus



Pied Crow – Photograph: Joe Grosel

CORVUS

A Crow by the Name of Corvus

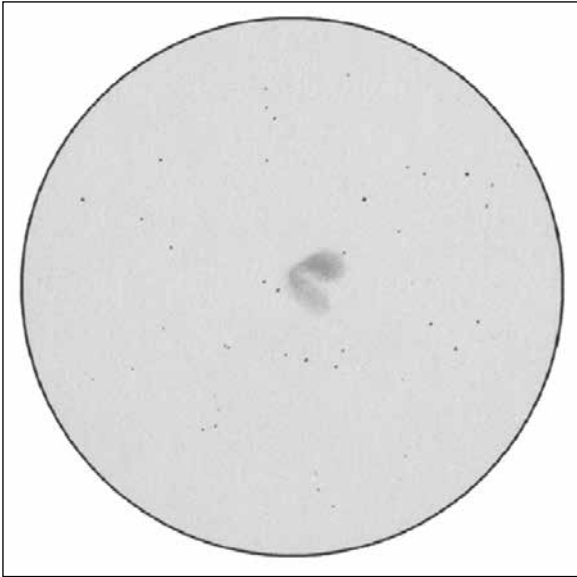
The world is home to many thousands of birds, but the crow is top of the pops as the bird that you'll find in every corner of the globe. The crow is exceptionally arrogant, and it also does an excellent job of mimicking other sounds. What is more, its feathered suit is a highly fashionable black and white. I've heard of a group of women referred to as "the crows"! Probably not very flattering, but clearly the bird deserves recognition and has also been honoured in the sky by having a constellation named after it.



Folklore has it that the bird, being sent with a cup for water, loitered at a fig-tree until the fruit became ripe, and then returned to the gods with a water-snake in his claws and a lie in his mouth, alleging the snake to have been the cause of his delay. In punishment, he was forever fixed in the sky with the constellations Crater (the cup) and Hydra (the snake). Corvus was also known in historical times as the Great Storm Bird or Bird of the Desert (*Star Names: Their Lore and Meaning* – Richard Allen).

Constellations with rectangular and triangular shapes make an impression and are also easy to remember: think of the constellations Corvus, Crux, Pegasus and Hercules. Corvus is ranked only as 77th largest. The brightness of its four slightly out-of-step corner stars ranges between magnitude 2.6 and 3, with gamma, the brightest then delta, beta and epsilon Corvi. The star alpha Corvi is situated south of epsilon and is less brilliant with a magnitude 4, and could perhaps be seen as the beak of the starry bird. Corvus makes its appearance in the east as the southern winter approaches, which also suggests the best time of year to search out galaxies.

Close to the border with Crater is **NGC 4027**, probably one of the most peculiar galaxies in this part of the sky, which is liberally strewn with galaxies. NGC 4027 displays a broad dense nucleus, slightly out of centre towards the southern part. With very high magnitude a hazy extension can be seen spreading out from the north-western side and spiralling gently around the northern side of the galaxy. NGC 4027 is a classic barred spiral, with its unique form suggesting it may have been in close contact with the companion galaxy **NGC 4027A**, which is situated only 3' to the south. This pair of galaxies was discovered by William Herschel on 7 February 1785.



NGC 4038 and NGC 4039 - Galaxies

The constellation can rightfully be proud of being home to the merging galaxies **NGC 4038** and **NGC 4039**, one of the most distinctive objects in the sky. The well-known and much-loved object forms a triangle to the west with magnitude 2.5 gamma and magnitude 2.9 epsilon Corvi. This splendid object is approximately 45 million light-years distant from us and one of the closest examples of interacting galaxies. It is formed in the shape of two soft ovals, distinctly connected to the east. The northern galaxy is slightly more defined and a tad bigger than NGC 4039. However, both galaxies display a

soft spread of light with a slight brightening towards their nuclei. With higher magnification parts of the surfaces appear somewhat patchy with dark knots and a few faint star points. They are known as the "Antennae Galaxies" because of their tidal tails extending away from the galaxies. When the cold starts hitting us at the beginning of the southern winter, this wondrous object floods the heart with a warm feeling that roughly resembles a heart shape.



NGC 4361 – Photograph: Wikipedia

The constellation is home to a relatively bright planetary nebula. **NGC 4361** forms a triangle with gamma and delta Corvi in the middle part of the constellation's stellar rectangle shape. William Herschel discovered the planetary in 1785, but didn't recognise it for what it was. At first glance the slightly east-west oval may be mistaken for a galaxy. What struck me, however, is the overwhelmingly bright centre with a magnitude 12 star enfolded by a soft, hazy halo. It expands into a second outer halo that appears thin and flimsy. The planetary nebula seems to be bathed in a soft,

grey colour and the rim appears broken and woolly. NGC 4361 has been classified as a rare quadrupolar planetary nebula.

Barely a degree north-west is the equally distinctive Tombaugh variable star or more to the point TV Corvi. Clyde Tombaugh was searching for trans-neptunian planets when he discovered what he thought was a nova in outburst on 23 March 1931. Now known as TV Corvi, the star was observed in outburst by David Levy in 1990. It is evidently a very remarkable star to be able to increase from magnitude 17 to magnitude 12 within days. Normally it is barely visible, even through the Palomar 48-inch Schmidt telescope. In all likelihood TV Corvi was a repeating 15-month dwarf nova known as a cataclysmic variable star. Super hump periods are usually a few percent longer than orbital periods. David Levy, who had a longstanding friendship with Clyde Tombaugh, caught the star again on 2 February 2005, rising and gaining rapidly in magnitude (*Guide to the Night Sky* – David Levy).

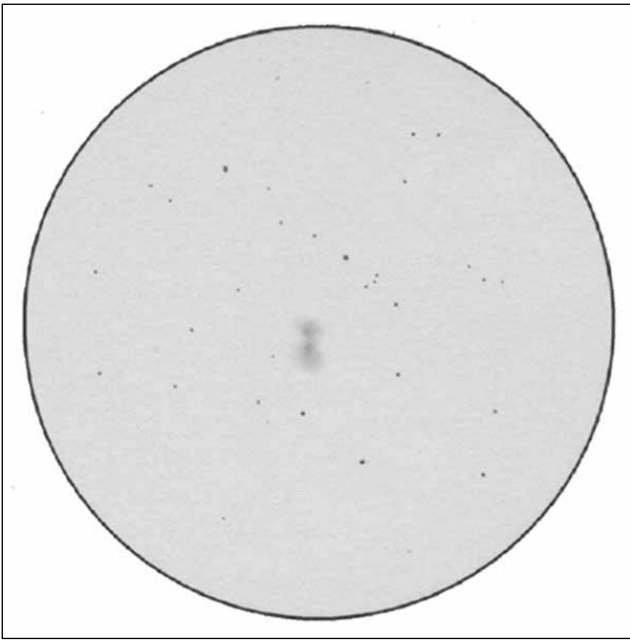
The asterism **STREICHER 23** resembles a cowboy in star formation and is situated about 5 degrees south-east of delta Corvi. Two prominent stars of similar brightness stare back at one like two eyes, and form the north-eastern end of the grouping. A faint string of stars running north to south resembles the long slender arms. The brightest star HD 111156 with a magnitude of 7.2, resembling the large, typical belt buckle, with the rest forming the sculptured legs, positioned well apart. Searching star asterisms are full of fun, with vivid imagination and thoughts.

The star that marks the north-eastern wing, delta Corvi, shines brightly with a warm magnitude 2.9. It is a double star in a position angle (PA) 214°. Although it has a separation of 24", the companion, which is only 9.2 magnitude, is not easily seen, owing to the glare of the primary.

One of the most beautiful star groupings, named **CANALI 1**, can be found in the northernmost part of Corvus. The nickname Star Gate fits the grouping, which comprises only six stars. The asterism was found by Eric Canali and is a near perfect equilateral triangle with two golden-yellow magnitude 6 and one magnitude 9 stars. Another almost perfect equilateral triangle of two magnitude 7 and one magnitude 11 stars nestle inside. A breath-taking composition which is well defined against a bare star field, never fails to impress. Once you've seen it, you will never let it out of your mind again.



Canali 1 – Photograph: DSS



NGC 4782 and NGC 4783 – Galaxies

In an area strewn with galaxies, the constellation offers another merging pair. **NGC 4782** and **NGC 4783** are situated in the north-eastern corner very close to the Virgo boundary. This object is a double-galaxy of the rare dumb-bell type. It comprises two prominent interacting elliptical galaxies barely an arc-minute apart. NGC 4783 displays a soft, round misty glow brightening up slowly towards the nucleus. NGC 4782, which is situated to the south, appears hazier around the edge. This object is about 178 million light-years away, yet is surprisingly bright through medium-

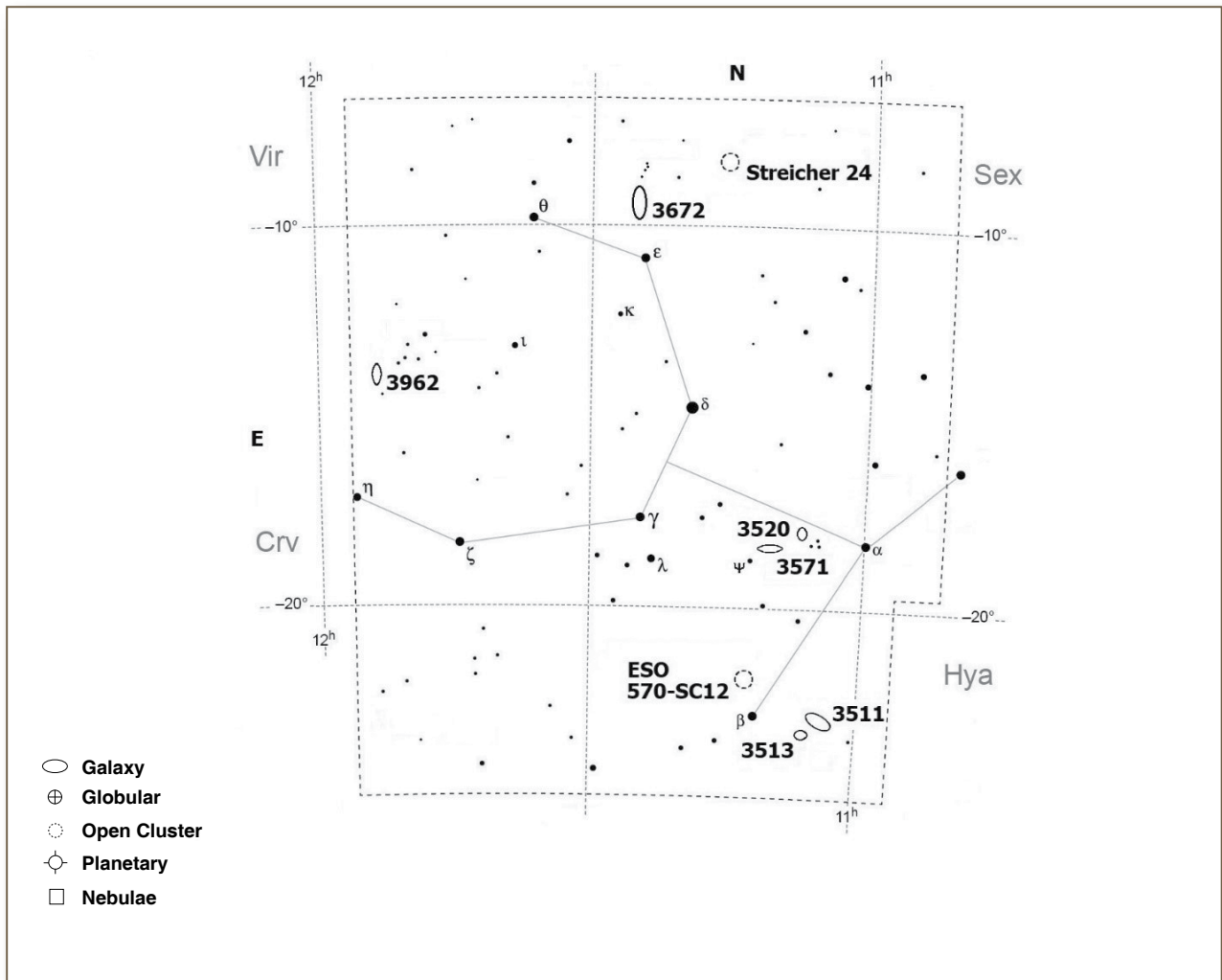
size telescopes. There are also other examples of this dumb-bell type galaxies like NGC 750/751 and NGC 545/47.

Corvus is truly packed with exceptional objects to make the cool southern autumn months unforgettable. I didn't find it at all strange to often hear a crow calling out that reminds me every time of the constellation with the same name.



Photograph: In-The-Sky

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 4027 NGC 4027A	Galaxy	11h59m.5	-19°16'.0	11.2	3.8'×2.3'
NGC 4038	Galaxy	12h01m.7	-18°51'.8	10.5	5.4'×3.9'
NGC 4039	Galaxy	12h01m.9	-18°53'.7	10.3	5.4'×2.5'
TV Corvi	Variable Star	12h20m.4	-18°27'.0	12-18	*
NGC 4361	Planetary Nebula	12h24m.5	-18°48'.0	10.3	45"
CANALI 1	Asterism	12h35m.8	-12°01'.0	6.5	7.5'
STREICHER 23 DSH J1247.3-1903	Asterism	12h47m.3	-19°03'.0	9.5	23'
NGC 4782	Galaxy	12h54m.5	-12°34'.0	11.7	1.8'×1.7'
NGC 4783	Galaxy	12h54m.6	-12°33'.7	11.5	2.3'×1.3'



The constellation of Crater

CRATER

A Cup full of Stars

The constellation Crater is one with a very common name, but when one thinks more about the name it could have several meanings. The one, and perhaps the most familiar in astronomy, is that ancient Apollo sent the crow Corvus with a goblet to fetch him some water, but he wasted time on his way, eating figs from a fig tree. Corvus then used Hydra the water snake as an excuse. In his rage, Apollo sent the crow, cup and water snake into the sky.



But the cup would have been one of the first household articles humans would have used early on, and is therefore probably deserving of a place of honour in the starry skies. Although this U-shaped pattern of stars, no brighter than magnitude 3.5, suggests a wine goblet named by the early Greeks, it surely lives up to its name.

Crater does not offer many different types of objects, but holds a good number of galaxies. Discover a drop of moisture next to the base of the cup with a pair of galaxies 2 degrees west of beta Crateris in the far southern part of the constellation.

NGC 3511 is a special galaxy that displays a fat, hazy oval in a north-east to south-west direction. It brightens slowly towards the middle with an oblong nucleus slightly north of centre. Closer investigation and high magnification reveal a hazy edge with magnitude 13 to 14 stars respectively on its tapered ends. Averted vision appears to let the galaxy grow in size. Only 10' south the circular glow of a companion barred galaxy **NGC 3513**, can be seen. In truly



NGC 3511 and NGC 3513
Photograph: Wikipedia

dark skies this galaxy shows its real colours. It displays a surprisingly bright central bar with some structure covered in a hazy envelope. Two faint stars can be glimpsed on the northern edge. It's a pleasant surprise to find an object with modest catalogue statistics that shows such clear detail.

ESO 570-SC12 is a lovely grouping of half a dozen magnitude 8 stars, only 1.5 degrees north of beta Crateris. The stars, mostly dressed up in yellow and orange, flow from north to south. Four stars draw the focus to the middle area forming a nice block impression.

The cup holds in its midst historical wine with the galaxy **NGC 3571** (also documented as NGC 3544) only 18' north-west of the 5.8 magnitude star psi Crateris. The galaxy displays only a faint streak of light in an east to west direction, with a faint stellar nucleus. NGC 3571 = NGC 3544 was found on 8 January 1886 by Ormond Stone with the Leander McCormick 66-cm refractor. The NGC position for NGC 3571 comes from William Herschel's single discovery observation on 8 March 1789, but is good enough to identify the galaxy unambiguously. The position was later verified by G. Bigourdan at Paris in 1888 and 1900, Kobold at Strassburg in 1901 and Porter at Cincinnati in 1906 and 1908. The galaxy is just bright enough for Shapley-Ames, and it has been listed in the subsequent literature under NGC 3571, which is more correct than the NGC position for NGC 3544. So, in spite of Paturel's use of the number NGC 3544 in RC3 (he perhaps followed ESO-B which has the listing as NGC 3544 = NGC 3571), but should retain NGC 3571 for consistency. (*History and Accurate Positions for the NGC/IC Objects* – Corwin 2004).

Astronomers use a galaxy as a lens to focus on a quasar billions of light-years away. It highlights the accretion disc's descent into a black hole. It is believed that QSO HE 1104-1804 is between 4 and 11 light-years across. The team led by Jose Muñoz of the University of Valencia in Spain studies this quasar.



NGC 3520 – Photograph: Second Digital Sky Survey

NGC 3520 has been listed as a cluster or asterism of four stars between magnitude 12 and 14. NGC 3520 is another of the Leander McCormick 66-cm refractor discoveries, this one in 1886 by Leavenworth. His indicated position is a few arc-minute east of the asterism with a description of the object spread over an area of 0.8' by 0.6' with a magnitude of 15.3, irregular with a few faint stars involved. That does not match the appearance of the asterism, in addition, they are far too faint. A then more likely match was ESO 570-G004, an interacting triple or quadruple system 1'.35" east and 5' south of the indicated position, or perhaps the galaxy NGC 3514 = ESO 570-

G001. NGC 3520 is now known as PGC 33648, an elliptical galaxy about 960 million light-years from Earth.

NGC 3962 is a galaxy with a difference! According to studies the various wave lengths show that the stars in this galaxy rotate at a right angle to the rotation of the gas. However, through a medium amateur telescope this elliptical star city shows only a slightly brighter nucleus. But it forms a nice triangle with two magnitude 10 orange coloured stars to the south.

There is a nice curved string of faint stars just a few arc-minutes north of the galaxy **NGC 3672**, which was a surprise. The galaxy forms a triangle with magnitude 4.6 theta and red coloured 4.8 epsilon Crateris to the north. NGC 3672 is a quite easy target shining with a magnitude of 11.4 in a north-south direction. The faint small galaxy IC 688 is only 20' to the west. Do not overlook the pair of elliptical galaxies NGC 3636 and NGC 3637 which are only 3' apart, situated a degree further south-west with a lovely orange magnitude 6.5 star between them.

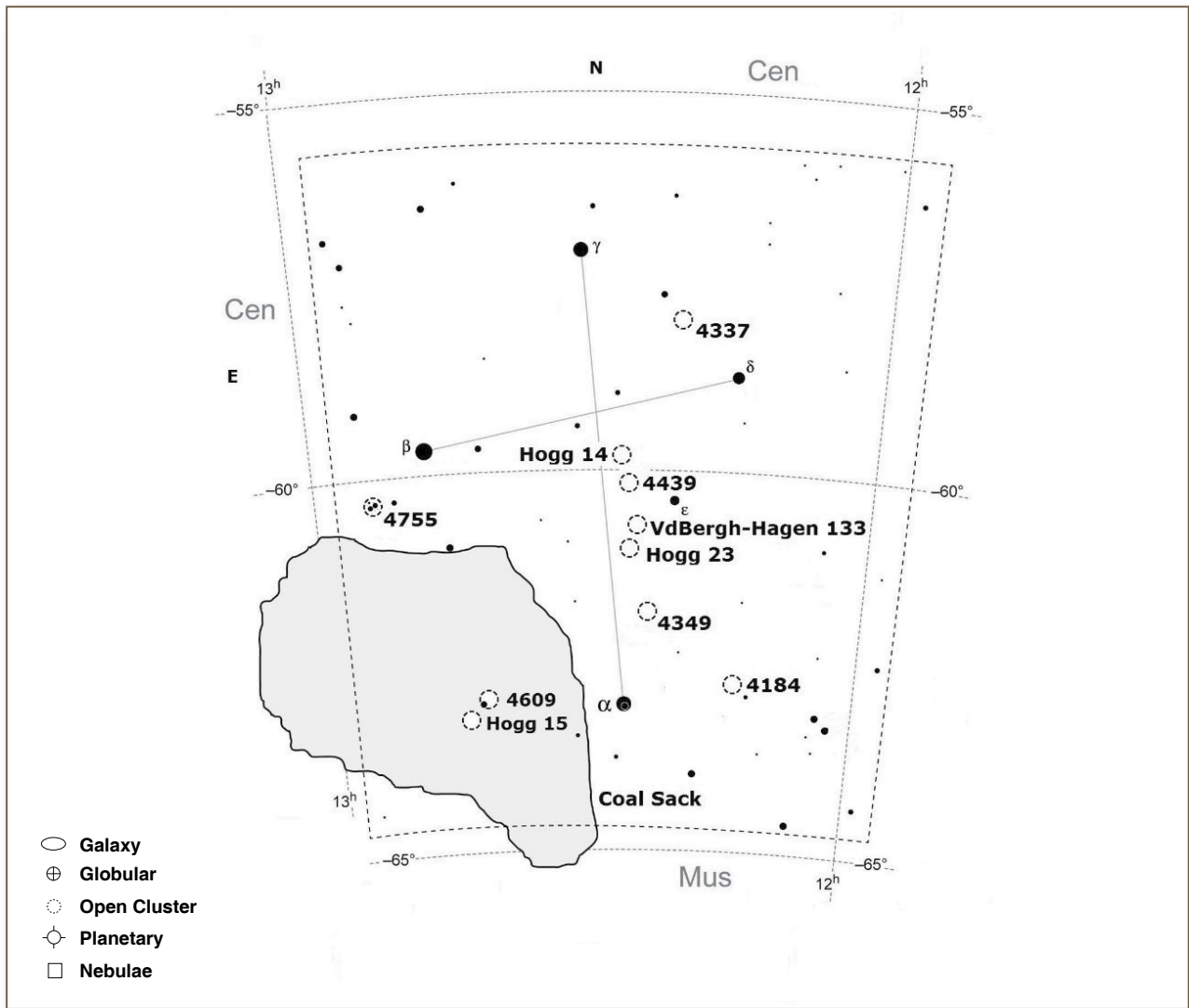
The brightest star in the constellation is delta Crateris with a spectral Type-K and obvious in a light-yellow colour. Further north is magnitude 4.8 epsilon Crateris and luck would have it that I stumbled on a star group, **STREICHER 24**, a further 4 degrees north. Take the last sip out of the heavenly cup and taste this asterism that resembles a more modern tin cup in formation. The stars opening towards the west with a magnitude 8.9 star towards south, resembles the end of the handle. Asterisms are scattered all over the starry skies and virtually every constellation should have a few outstanding ones.



STREICHER 24 – Photograph: DSS

Don't let a crow or a snake keep you away from a cup full of stars that has more to offer than a glass of wine!

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 3511	Galaxy	11h03m.4	-23°05'.2	11	5.5'×2.0'
NGC 3513	Galaxy	11h03m.8	-23°14'.7	11.5	2.9'×2.3'
NGC 3520	Galaxy	11h07m.2	-18°01'.5	15.3	1.3'×1'
NGC 3571	Galaxy	11h11m.5	-18°17'.4	12.1	3.4'×1.0'
STREICHER 24 DSH J1111.6-0835	Asterism	11h11m.6	-08°35'.5	8	8.5'
ESO 570-SC12	Open Cluster	11h12m.2	-21°19'.0	8.3	13'
NGC 3672	Galaxy	11h25m.2	-09°47'.8	11.4	3.9'×1.8'
NGC 3962	Galaxy	11h54m.7	-13°58'.2	10.7	2.6'×2.2'



The constellation of Crux



The Bagamoyo Cross on the east coast of Africa
 Photograph: Johan Badenhorst

CRUX

Our Southern Heritage

An exploration of the southern trophy, Crux, is definitely a highlight. Not only is it the smallest constellation of a total of 88 in the sky, it is one of the most popular. The Southern Cross reminds me of the many crosses planted by the early explorers; today found along the coast amongst the rocks and between lighthouses. We are indeed privileged to see a starry cross in our sky, especially since this cross aptly shows the direction to true south. Drawing a line from gamma to alpha Crucis and extending it some 25 degrees, or roughly four and a half times, points us to the South Celestial Pole.



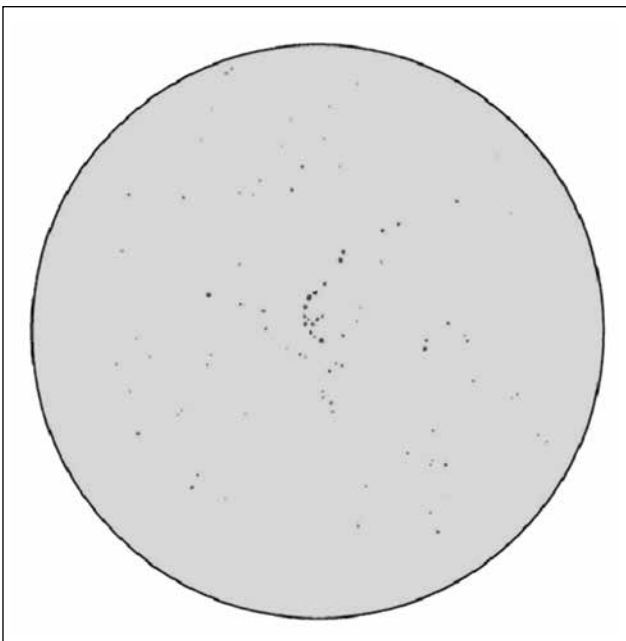
The Portuguese navigators saw the Crux as a symbol of their faith. It is also an honoured symbol on the flags of Australia and New Zealand. Claudius Ptolemy originally assigned beta, gamma and delta Crucis to the constellation Centaurus. Ptolemy, the most influential Greek astronomer of his time, propounded a geocentric theory which was accepted for 1400 years. A lunar crater is named after him. It is generally believed that the French astronomer Augustine Royer formally split Crux off from Centaurus in 1679 and gave it its own identity.

Crux is loaded with a multitude of bright and beautiful star clusters in a variety of shapes and sizes and if I had to share all, they would fill up several pages. Only binoculars are needed: just lie comfortably and flat on your back and explore the variety of star groupings in this constellation. The best time is towards the end of the southern hemisphere's summer, when it is ideally located high up in the sky and the described directions are relevant.

The constellation Centaurus literally stands guard over the cross on three sides with Musca to the south. Each of the four corner stars holds its own fascination. The magnitude 1.4 alpha Crucis occupies the southern tip of the Crux constellation and is a brilliant bluish-white pair, 370 light-years distant.

The neighbouring beta Crucis, also known as Mimosa, is a brilliant white star of magnitude 1.3, lying to the east on the short arm of the Crux. It is also one of the brightest stars in the sky, around 500 light-years distant. A crimson-red star of magnitude 8.6 situated just 2.4' west makes a fine contrast. On the western end of Crux's short arm, the variable star magnitude 2.7 delta Crucis can be seen some 360 light-years distant. It has a massive expanding stellar shell and a rotation period of only 3.6 days. On the opposite side of the cross is gamma Crucis, the beacon star of the constellation. It is a red giant of Type-M4 with a magnitude 1.6 and also the nearest of the four Crux stars, 89 light-years away. It is also the nearest red giant, similar to the star Antares in the constellation Scorpius. The true fifth wheel on the Crux wagon is magnitude 3.5 epsilon situated between alpha and delta Crucis. In a way it spoils this unique cross shape, but at the same time distinguishes it from the other starry crosses in the night sky.

A very nice cluster, **NGC 4337**, is easily seen and situated between the corner stars gamma and delta Crucis. The grouping displays a sort of necklace impression with spaced faint stars in knots on a string towards the middle part and curved out with two strings of stars to the north and east. The eastern string ends with a pair of magnitude 7 yellow coloured stars. This is quite an impressive little group and definitely one of a kind.



NGC 4439 – Open Cluster

Move your action towards the crossbar section of Crux to explore two clusters very close together. **NGC 4439** is situated a degree north-east of epsilon Crucis. This group is one of my favourites and seems in combination to be the sickle emblem of the Russian flag. Approximately eleven stars resemble an eastern dome-shape that stands out well against the background star field. Three faint stars nestle inside the dome, pointing to the western side. Two comparative magnitude 8 stars are situated towards the north. What is also true is that open star clusters

in their compilation ensure contentment in a journey to far away destinations.

The cluster **HOGG 14**, is situated a further 18' to the north of NGC 4439. It comprises a few faint stars with an overall brightness of magnitude 8.5. The stars are only visible because they stand out slightly against the background star field, with the brightest star member magnitude 10. While investigating the member stars of this group, Brian Skiff, gives a position of RA: 12h28m.6s – DEC: -59°48'.0 (2000.0). This is exactly the same value as given in (*Star Clusters* – Brent Archinal and Steven Hynes).

Continue southwards in the direction of alpha Crucis to find more clusters. **VAN DEN BERGH-HAGEN 133** is situated just north of the cluster NGC 4349. My first impression of this cluster is a handful of lovely coloured stars, shaped like a broken heart. The middle part has a short straight bar in a north to south direction which is somewhat brighter than the rest of the stars in the group. The Dutch-born Canadian astronomer Sidney van den Bergh published a list of 158 objects in 1966.

Situated 11' south-east of VdB-H 133 is **HOGG 23** with only a handful of stars denoting the position with a 7.1 yellow star to the west. The identities associated with the clusters in this area are among the most confusing of any close groupings in the sky. Examination of the Franklin-Adams plates shows the grouping consists of two bright stars surrounded by several fainter ones. The group measured from the DSS includes the star HD 108544 as one of the members. Another pair of stars HD 107978 and HD 107979 indicates the position of Cr 257 which is situated 28' towards the west of Hogg 23, and named after the Swedish astronomer Per Arne Collinder. The faint grouping Harvard 5 is just 12' east of VdB-H 133.

The exceptional cluster **NGC 4349**, situated 1.3 degrees north of alpha Crucis, about midway to epsilon Crucis, is quite easy to find. Dunlop discovered this bright outstanding cluster, describing it as pretty large with extremely faint stars. The cluster displays a multitude of stars that spiral and snake away from a slightly more crowded centre. One extension of very faint stars swings out of the cluster's western side towards the north, almost like a curly seashell. In his journal John Herschel wrote that this cluster was observed with his friend Thomas Maclear, the then Astronomer Royal of the Cape Observatory. John Herschel spent the years 1834 to 1838 surveying the southern sky from the Cape of Good Hope.



NGC 4349 – Photograph: Wikipedia

Certainly, difficult to locate is the combined cluster/nebula **NGC 4184**, situated about a degree towards the west of alpha Crucis. With careful observation only faint glimmers of starlight can be seen embedded on a subtle oval haze.



I don't have to introduce you to the well-known dark nebula the **COAL SACK** which is a starless irregular dark cloud adjoining alpha and beta Crucis, covering a 5×7-degree area at a distance of over 550 light-years. In dark unpolluted skies this unusual rare dark piece of sky against the star field of the Milky Way can be easily seen with the naked eye. William Herschel once referred to dark nebulae as "holes in the heavens" and heaven knows what his thoughts might have been at the time. For the Australian Aborigines the Coal Sack is the constellation Emu, with alpha Crucis as his eye. One of my most precious memories was of being in the deep dark Kalahari and seeing the Coal Sack hanging like a dark cloud of just nothing on the arm of the Southern Cross, in a night

sky filled with brilliant scintillating stars. Dieter Willasch provided me with this excellent photograph of the Coal Sack. He decided to extend pure observing by entering the world of digital astro-photography with great success.

Two more clusters are situated close to one another inside the Coal Sack dark nebula. **NGC 4609** is an easily visible cluster with about 12 outstanding stars, one shining with a red hue. The cluster is situated only 6' north-west of a magnitude 5 star also known as BZ Crucis, one of the rare Type-Be stars. The group appears like an artistic, stylised impression of a comet. The star BZ Crucis forms the nucleus and the cluster the tail with members extending and spraying out to the north. At both the southern and northern end of the grouping lies a small triangle of faint stars. Auke Slotegraaf called it an oblong bow-tie, or even an elongated rectangle.

HOGG 15, situated only a few arc-minutes south-east of NGC 4609, consists of four stars of approximately magnitude 12 denoting the position. Hogg 15 was first recognized as an open cluster by Arthur Hogg in 1965. It is one of the few clusters known to lie in the inner spiral arm of the Milky Way, much further behind the adjacent cluster NGC 4609. The age of Hogg 15 is in very good agreement with the results obtained from integrated spectroscopy. The object is clearly the best match confirmed as a highly reddened young open cluster.

Of course, we should take pride in what is surely one of the most beautiful star clusters south of the equator.

NGC 4755, our pride and joy, is situated only a degree south-east of beta Crucis. The Jewel box, or to use the other name, Kappa Crucis Cluster, is surely a champion in its class.

In a statement made by John Herschel, he

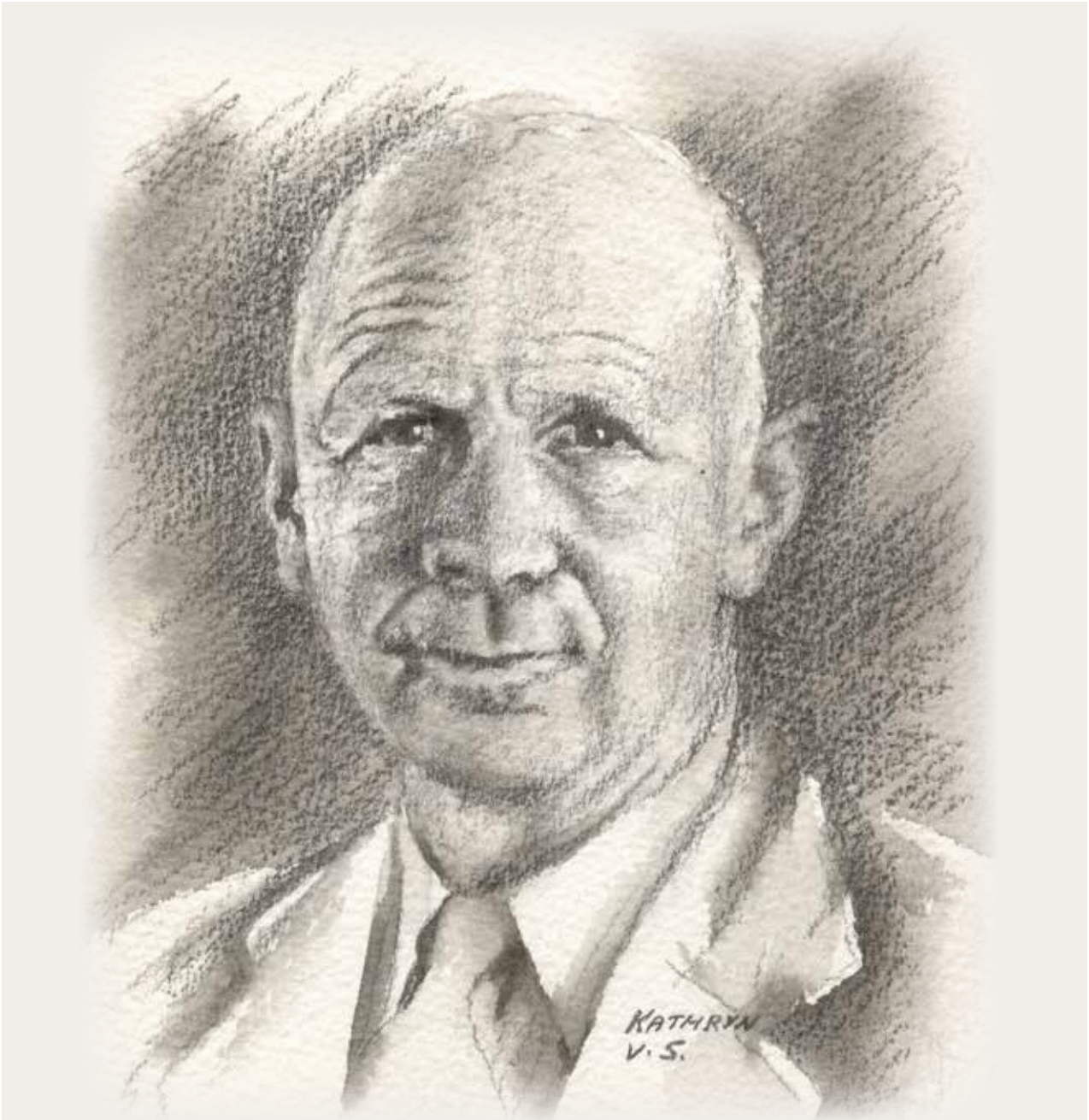
compared this stellar group to a superb piece of fancy jewellery. As a piece of creative thinking, Dave Gordon's description of the stars within this cluster is unique: "a burnt orange giant, a dusty yellow main sequence, handfuls of omo whites and some sparkling surf super blues". I am always amazed by the three colourful stars in a row towards the centre crossbar in this outstanding cluster, resembling in a way Orion's belt stars. According to Willie Koorts it took the imagination of a child to see these three as a traffic light with mixed up colours! Explore this cluster through the telescope or binoculars – your effort will not be in vain.

Between beta Crucis (Mimosa) and beta Centauri (Hadar) a large number of open clusters can be seen like NGC 4852, 5043, 5045, 5120, 5138, 5155, 5168, 5316 and IC 4291 an enjoyable part to explore.

Don't neglect open clusters, not only are they still easy to see in our polluted skies, they also bring a splash of delight and wonder to the eye.



NGC 4755 – Photograph: Dale Liebenberg



Arthur Robert Hogg – Pencil Sketch: Kathryn van Schalkwyk

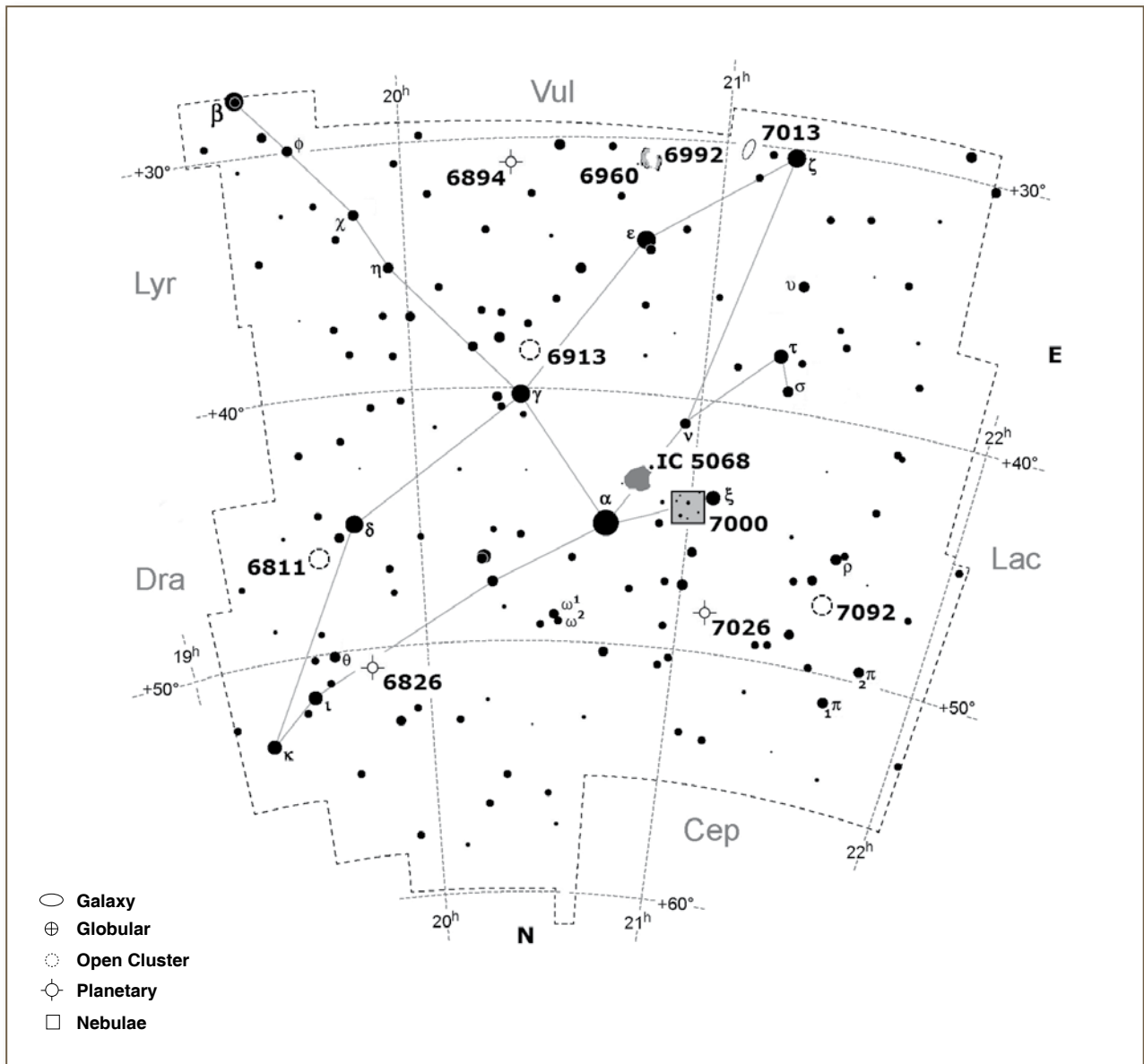
Arthur Robert Hogg (1903–1966) compiled a list of 22 with a possibility of perhaps 23 southern open clusters. Hogg was born in Victoria, Australia, and studied at the University of Melbourne, where he graduated with a Master of Science in 1925. He joined the Commonwealth Solar Observatory in 1929 and it was only in 1946 that he became an astronomer. He remained at the CSO (which later changed its name to Mount Stromlo) for the rest of his life.

A few years ago, I had the privilege of showing the southern skies to Daniel Ravier, visiting President of the Ocean Astronomy Association in France. Great was my surprise when I read a poem afterwards written by Daniel for our local newspaper.

*Magdalena, montre-moi la Croix du Sud montre-moi cette Croix magistrale
Avec soin pointeur qui nous guide la nuit, Le CarEne, et le Sagittaire qui luit
Comme un feu dessus ta ferme tropicale
Que les astronimeures de l’Afrique et tout le monde ont toujours là
vue de l’océan à fournir autant savoir avec amitié et humanité*

*Magdalena, shows me the Southern Cross, the Cross that is so fantastic with
its marker that is used to guide in the night.
Carina that is bright as a fire over your tropic home.
May the astronomers of Africa and the world, always have the ocean in view
for sharing knowledge and friendship with all humanity.*

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 4184	Open Cluster Nebula	12h13m.6	-62°42'.0	12	3'
NGC 4337	Open Cluster	12h23m.9	-58°07'.4	8.9	3.5'
NGC 4349	Open Cluster	12h24m.5	-61°54'.2	7.4	8'
VAN DEN BERGH-HAGEN 133	Open Cluster	12h27m.3	-60°45'.7	7.1	5'
NGC 4439	Open Cluster	12h28m.4	-60°06'.2	8.4	4'
HOGG 23	Open Cluster	12h28m.5	-60°53'.7	9.5	7'
HOGG 14	Open Cluster	12h28m.6	-59°48'.0	9.5	3'
NGC 4609	Open Cluster	12h42m.3	-62°58'.3	6.9	5'
HOGG 15	Open Cluster	12h43m.6	-63°06'.1	10.3	2'
NGC 4755	Open Cluster	12h53m.6	-60°20'.4	4.2	10'



The constellation of Cygnus

CYGNUS

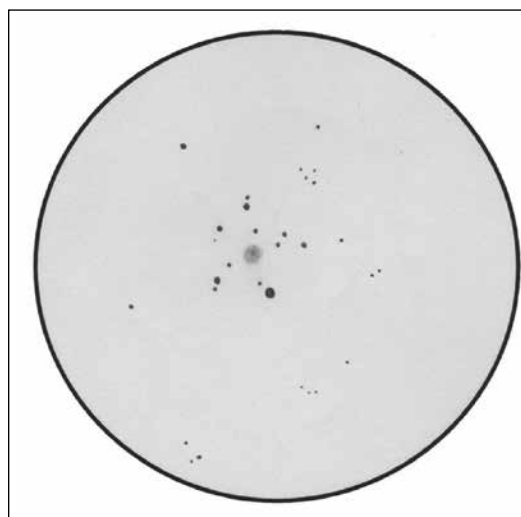
Another Cross

It cannot be otherwise: if the southern starry skies have a cross (Crux, the Southern Cross) then of course one also has to be found in the northern skies. Exceptionally bright and stretching all the way from the Milky Way to the northern horizon where the Cygnus constellation, also known as the Northern Cross, hangs on its edge. I try and fathom the beauty of the Milky Way's absolutely silky-soft appearance as it spans the entire night sky with its multiple fascinating facets.



The Northern Cross definitely boasts some exceptional objects, which are found in the lower reaches of the Milky Way. The stars in formation that represents the cross are alpha (Deneb), gamma, epsilon, delta and beta Cygni. What I always find interesting is the way nicknames are given to deep-sky objects, and particularly by northern amateurs. Cygnus, therefore, has no shortage of objects that boast an array of nicknames in abundance. Cygnus is equally better known as the Swan, and appears to represent some flying bird of sorts.

Look first at the western part, where the 3.7 magnitude star kappa, the double star iota and theta Cygni are located. The planetary nebula **NGC 6826**, better known as The Blinking Nebula, can be found only a degree north-east of theta Cygni. NGC 6826 is a fine, bright bluish-green nebula slightly elongated from north-west to south-east. My fortunate position in South Africa has enabled me to easily locate this object. The disc conveys a hazy impression with a prominent magnitude 10.6 central star and outer envelope. This beautiful nebula certainly blinks, as its name states. It works like this: stare directly at the centre of the star-like core of the planetary until the brightness overwhelms the eye and the nebula disappears. However, with the use of averted vision the nebula grows again fully and reappears. There are several other planetary nebulae that have the right central star to the nebula brightness to show of this effect. William Herschel discovered this planetary nebula in 1793.



NGC 6826 – Planetary Nebula



NGC 6811 – Photograph: Wikipedia

Move along up on the side of the feathery bird's wing to the magnitude 2.9 delta Cygni. Just north of delta Cygni the small open cluster **NGC 6811** can be found. It is a very faint spacious grouping of stars with some open areas and more so towards the middle part. With imagination it displays an old bicycle shape with faint strings of stars stretching out into the field of view. Brighter stars take up space alongside the cluster towards the west which is immediately seen.



NGC 6913 – M29 – Photograph: Wikipedia

Way up towards the middle area of the constellation is the beautiful magnitude 2 gamma Cygni. Situated 1.5 degrees south from gamma at this far end of the Milky Way is another cluster, **NGC 6913**, better known as Messier 29. The cluster comprises only a few bright stars quite outstanding against the busy star field. The group is arranged in the form of a reverse-shaped letter K. This lovely handful of stars displays a boxy impression with the southern part more defined. It is a beautiful part of the constellation which is worth taking one's time over discovering.

Just 23' north of gamma Cygni another fine cluster, NGC 6910, is also worth a glance with an open mind.

Look the bird in its eye with beta Cygni or refer to the star Albireo, which is one of the most exceptional and attractive double star combinations in the entire starry skies. The primary magnitude 3.1 has an unusual golden yellow colour, which contrasts beautifully with the blue-green reflected by the fainter magnitude 5 with a separation of 34.4" in a position angle (PA) of 54°. The system was previously identified as multiple in the Hipparcos Input Catalogue.

The planetary nebula, **NGC 6894**, is situated close to the border with the constellation Vulpecula. Although its indicated magnitude is not at all favourable, it is relatively easily seen. And here come the nicknames: known as the Miniature Ring Nebula, this baby nebula however displays a thin smoky ring. A magnitude 14 star close to the nebula's northern edge gives it another nickname: The Diamond Ring Nebula. William Campbell discovered this unusual object at Lick Observatory in 1893. Campbell's star completely overpowers the tiny disc.



NGC 6894 – Photograph: Adam Block

Further east, a complex area of diffuse nebulae can be found with **NGC 6960** and **NGC 6992** the brighter parts of this complex. It is famously known as the Veil nebula, but also by the names Cirrus and the Bridal Nebula. Quite surprisingly, this flimsy, elongated loop of light was easily visible when Tim Cooper and I observed it a few years ago. The star 52 Cygni can be seen on the western edge of the curved nebula. The central lower southern segment of the Veil is known as Pickering's Triangular Wisp, which is visible through an oxygen (O-III) filter. This supernova remnant exploded about 30 to 40 thousand years ago. William Herschel discovered the complex with his 18-inch reflector telescope in 1784.



NGC 6992 and NGC 6960
Photograph: Wikipedia

Another surprise was to find a galaxy in this part of the Milky Way awash with nebulosity 2 degrees west of zeta Cygni. **NGC 7013** displays an oval streak of light in a north-west to south-east direction. Although faint at first, it was seen with averted vision with a few stars in the field of view. A star of magnitude 12 can be glimpsed on its north-western tip. This galaxy requires long and intensive observation to bring the long silver streak out well.

The large dark faint Northern Coal Sack is indicated by the name **IC 5068** and is situated between alpha and nu Cygni with a few faint stars embedded.

More famous and just to the east of alpha Cygni is **NGC 7000**, known as the North American Nebula. Wolfgang Steinicke indicates the following: with a 4¼-inch f/4, a 20 mm Erfle and a UHC filter, the nebula is bright and large, filling the 1.5 degrees field with view. The brightest section is the indicated Mexico part with the Pelican Nebula (IC 5067) nearby. Many stars are involved in the nebula. The Pelican Nebula also plays home to God's Finger, IC 6057 (Herbig-Haro 555), a dark trunk-like pillar.

There is a burger to eat in this birdy constellation in the impression of the Cheeseburger Nebula indicated as **NGC 7026**. This tasty object is situated halfway between alpha Cygni and the double star pi Cygni in the northern part of the constellation. NGC 7026 is pretty small, shining in a soft blue-green colour in a north-east to south-west direction. It is a bipolar nebula and has two gaseous lobes that expand away from a common centre. A very faint star is superimposed on the nebula, but is not the one that illuminates the nebula.



NGC 7092 – M39 – Photograph: Flickr

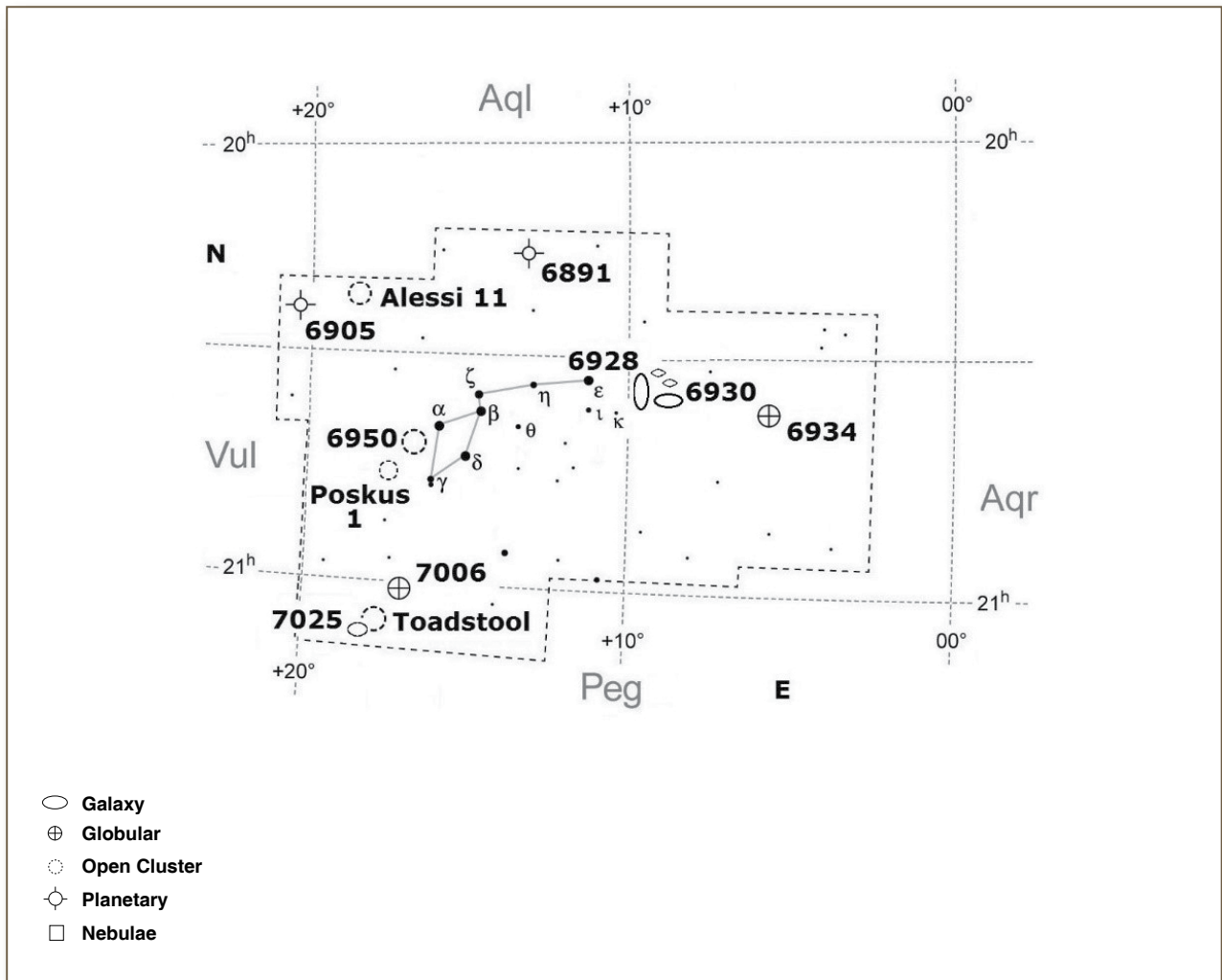
A further 3 degrees north of rho Cygni is the open cluster **NGC 7092**, better known as Messier 39. It is a lovely outstanding grouping of approximately two dozen stars to be enjoyed with low magnification through a medium sized telescope. The cluster was discovered by Guillaume Le Gentil in 1750 and Messier added it to his catalogue in 1764.

Asterisms are decidedly among the most exciting star groupings for launching a celestial search. To observe deep sky objects is one thing, but there may be a gem in the area just waiting to be discovered in exceptionally small star groupings. Add the following asterisms to your list next time around.

1. A Fairy Ring asterism at RA: 20h04m – DEC: +38°10'.
2. Baseball asterism at RA: 20h03m – DEC: +35°20'.
3. Eklund's asterism at RA: 20h23m – DEC: +38°54'.
(Three of these stars are members of Cygnus OB I).
4. Matthew's asterism is a zig-zag trapezium, at
RA: 19h43m – DEC: +38°21'.
5. The Leaping Dolphin asterism at
RA: 20h24m – DEC: +41°37'.

Even if we here down south cannot glimpse the constellation Cygnus in its full splendour, there is surely enough to talk about.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6811	Open Cluster	19h36m.9	+46°23'.2	6.8	13'
NGC 6826	Planetary Nebula	19h44m.8	+50°31'.0	9.8	25"
NGC 6894	Planetary Nebula	20h16m.4	+30°34'.1	12.3	42"
NGC 6913 Messier 29	Open Cluster	20h23m.9	+38°32'.8	6.6	7'
NGC 6960 NGC 6992	Emission Nebulae	20h45m.7 20h56m.4	+30°43'.2 +31°43'.0	7 8	210'x160'
IC 5068	Diffuse Dark Nebula	20h50m.8	+42°31'.0	-	40'x30'
NGC 7000	Nebula	20h58m.8	+44°20'.0	6	120'x100'
NGC 7013	Galaxy	21h03m.6	+29°53'.7	11.3	4.8'x1.5'
NGC 7026	Planetary Nebula	21h06m.3	+47°51'.4	10.9	21"
NGC 7092 Messier 39	Open Cluster	21h32m.2	+48°26'.0	4.6	31'



The constellation of Delphinus



The Durban Country Club

Three friendly men – Chris, Auke and Atze – enjoy the symposium delights



DELPHINUS

A Dolphin in Durban

The constellation Delphinus is but a tiny little fellow, just east of the constellation Sagitta, south of the constellation Vulpecula and squashed between the constellations Pegasus, Equuleus and Aquila. It was also called Job's Coffin, after the four head stars in this constellation. Nonetheless, the constellation lives up to its marine-related name because of its strong resemblance to a dolphin. The double star gamma is situated on the north-eastern corner, easily imaginable as its snout, with alpha as the north-west point, delta towards the south-east and beta on the southern corner.

Further south a group of faint stars surrounds theta, while its tail is a graceful arc consisting of eta and finally epsilon Delphini at the southern tip.



My decision to include this constellation in the running column has been entirely motivated by the wonderful 2008 South African Astronomy Symposium held in the city of Durban during the year of my ASSA Presidency. Quite appropriately and without any reservation, I dedicate this chapter to all the people who contributed to making the symposium such an enormous success. The front veranda of the Durban Country Club is the blue, blue ocean, and for us "plattelanders" who are accustomed only to concrete and bushveld, it was a wonderful opportunity to enjoy the beautiful view of the sea.

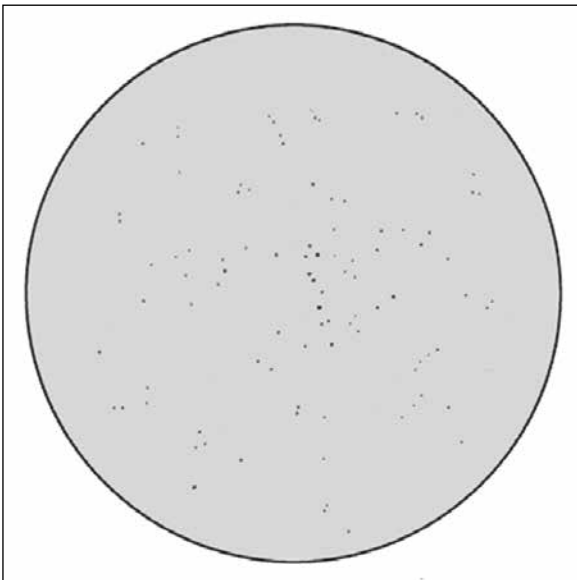
The constellation Delphinus inevitably turns one's mind to the thousands of species that inhabit the ocean. Can one possibly begin to appreciate how massive the ocean really is and what vast array of life-forms are found in its depths? Comparing it to the night sky with its millions and millions of stars may just help us imagine it.

The first object to discuss in the starry Delphinus is the planetary nebula **NGC 6905**, also known as the Blue Flash Nebula, or the Jelly Fish Nebula, situated in the furthest north-western corner of the constellation. This well-known jewel is an oval, out-of-focus puff, slightly elongated north-south, just west of a triangle of magnitude 11 stars.



NGC 6905 – Photograph: Lucas Ferreira

NGC 6905 displays a frosted blue-green colour with a thin envelope closely hugging on its outer edge, and surrounded by faint pinpoint stars and slightly brighter towards the centre. The unseen estimated magnitude 14 central star has an extremely high surface temperature of about 100 000 Kelvin.



ALESSI 11 – Asterism

The asterism **ALESSI 11** is situated 1.7 degrees south of NGC 6905. This beautiful group of stars could be called the Broken Heart Cluster, if you've ever seen one amongst the star formation. At first it is slightly difficult to lift out the group of stars against the very busy field stars. The V-shape of the heart points towards the south with a well-shaped eastern lobe and somewhat distorted western side.

About 50' north-east of magnitude 3.7 alpha Delphini the open star cluster **NGC 6950** can be seen. At first glance it appears to be a star field comprising of numerous faint stars. Closer investigation and higher magnification reveal approximately 30 stars in a very loose, spacious group, standing out slightly from its surroundings. A short string of three very close stars comprises a middle bar in an east-west direction. The grouping shows a noticeable V-formation or triangle with stars slightly more compact towards the north.

POSKUS 1 is another dainty but rather faint asterism situated only 16' north-west of the double star magnitude 4.2 gamma Delphini. This handful of stars displays the shape of a mandolin or flyswatter, to use the expression of Sue French.

The planetary nebula **NGC 6891** is situated virtually on the western border with the constellation Aquila. This very tiny blue dot has a high surface brightness and appears just like an out of focus planet Uranus. Higher magnification shows off a frosted look with a thin hazy edge. The magnitude 12.4 central star was observed with averted vision. The object is believed to be about 7200 light-years away. The planetary nebula was discovered by Ralph Copeland in 1884 by visual spectroscopy using a 6-inch refractor.

Let us now explore a neat group of four galaxies NGC 6927, 6927A, 6928 and 6930 situated 1.4 degrees south of the tail-end star epsilon Delphini. The brightest north-eastern member, **NGC 6928**, appears as a lovely elongated east to west cigar-shaped galaxy. Mottled areas can be detected on the surface with a glimpse of brightness towards the centre. **NGC 6930**, situated 3' south from NGC 6928 is also an elongated galaxy in a north to south direction, with a very low surface brightness, barely brighter towards the centre. NGC 6927 and NGC 6927A, the western pair of the group, appear only as two very faint specs of light. The group of four galaxies in a rectangular form cover a star field of just 6.5' in size. Albert Marth discovered the galaxies on 15 August 1863 with the 48-inch reflector on Malta.

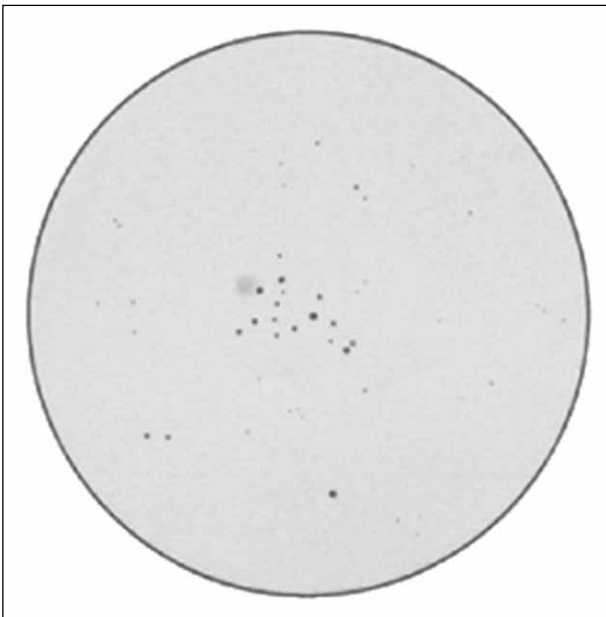
Globular clusters are special and very rewarding to study. **NGC 6934** is situated 2.5 degrees further south from the above-mentioned group of galaxies. This globular cluster is relatively bright and is situated towards the eastern end of a few bright field stars. It consists of a mass of star points embedded in a soft, unresolved, distinct core. Faint stars flare out towards the south-west in a cup-shape, whereas, towards the eastern end starlight suddenly tapers down. One's attention is also drawn by a prominent magnitude 9 orange coloured star situated on the western edge of the globular cluster.



NGC 6934 – Photograph:
Lucas Ferreira

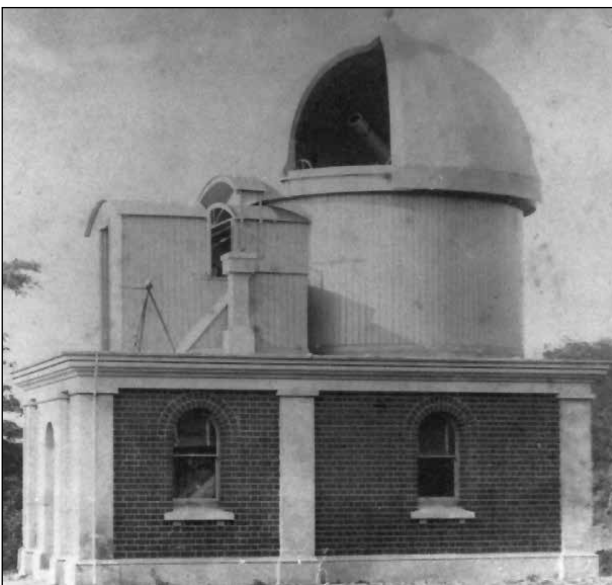
Some of the most interesting objects can be found in the constellation's easternmost part. About 1.8 degrees west from the Pegasus border, the globular cluster **NGC 7006** finds home. The object was first picked up in 1784 by William Herschel who saw it as small, faint and difficult. To me this globular cluster displays a washed out, hazy light, gradually getting brighter towards the core. In a way it looks more like a planetary nebula and not a globular cluster.

The only stars resolved are a pair of magnitude 14 stars on the southern periphery of the globular cluster but are most likely foreground stars. Auke Slotegraaf describes NGC 7006 as a round ball of fuzz, difficult to see, but with averted vision it seems to become brighter towards the centre. Larger telescopes and higher magnification may recognise a clumpy appearance and mottling, but I doubt that it can be resolved using any amateur instrument. The cluster is about 150 000 light-years away from us, drifting independently as a remote object. The exact distances are: 135 kly from the sun, and 126 kly from the galactic centre. NGC 7006 is the NGC globular with the second largest distance after NGC 2419. Samuel Hunter, using the 72-inch at Birr Castle, was the first to see NGC 7006 as a "light mottled globular cluster" on 15 September 1863.



NGC 7025 – Galaxy and Asterism

Continue along a line 1.5 degrees further east from NGC 7006 to find the galaxy **NGC 7025**, very close to the Pegasus border. This galaxy is merely a faint smear of oval light in a south-west to north-east direction. Sue French noted the asterism, which flanked the western side of the galaxy. The group consists of about a dozen magnitude 10 stars in a triangular shape which stands out quite prominently against the starry field. The grouping is slightly elongated in an east-west direction with the galaxy NGC 7025 at the asterism's north-east base. This asterism is now known as the Toadstool or Missing Mushroom.



Photograph: Local History Museums' Collection, Durban

The ever-willing Peter Cramb took some time out to take Chris de Coning and me to visit the site of the old Natal Observatory in Currie Road on Durban's Berea.

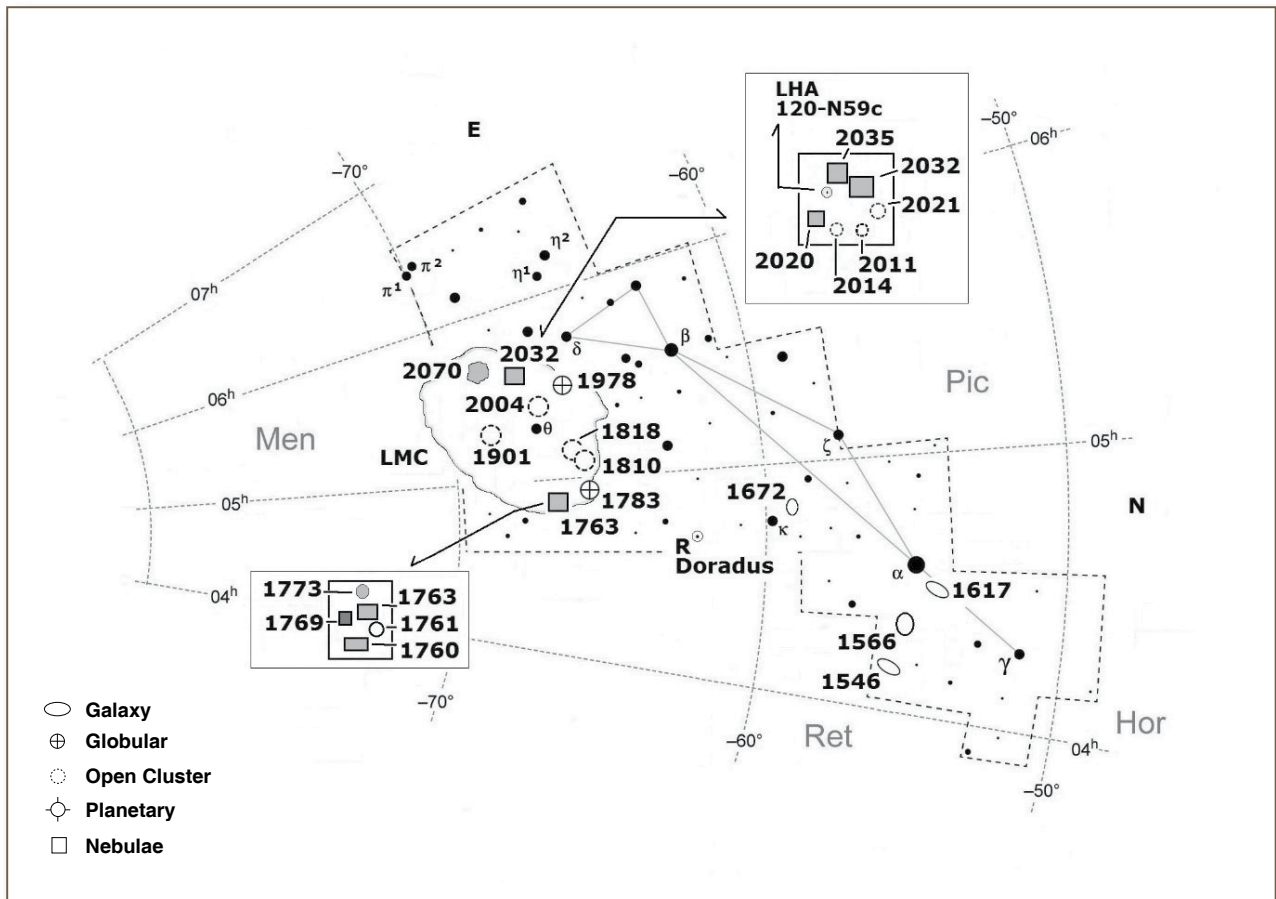
Peter also provided me with valuable information and help. The observatory had been built for Natal's only astronomer, Edmund Nevill, at the time of the Transit of Venus in 1882. The site is now in an advanced state of decay.

The riches of the stars in Delphinus match the richness of the fare at the Durban Symposium. The fruitful interaction and association (like a pod of Delphini) between amateur and professional astronomers was once again in evidence for all of us who are so passionate about the night skies. The always cool and calm Mike Reid handled everything so well. Ian Glass, who knows the history of Galileo, was responsible for a good dollop of nostalgia! Cosmology may sound very complex, but for Frikkie de Bruin it is a passion that astounds. And of course, the deep-sky addicts among us in the person of Auke and myself tried to plumb the depths of every speaker's knowledge in the finest detail.

A gift of a crystal containing a dolphin was presented to me, a treasure that will always remind me of the Durban Symposium and KwaZulu-Natal's friendly people.



OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6891	Planetary Nebula	20h15m.2	+12°42'.0	10.4	14"
ALESSI 11	Asterism	20h21m.4	+18°21'.2	9	7.5'
NGC 6905	Planetary Nebula	20h22m.4	+20°07'.0	10.9	39"
NGC 6928	Galaxy	20h32m.8	+09°56'.0	12.2	2'×0.6'
NGC 6930	Galaxy	20h33m.0	+09°52'.0	12.2	1.5'×0.5'
NGC 6934	Globular Cluster	20h34m.2	+07°24'.0	8.7	5.9'
NGC 6950	Open Cluster	20h41m.4	+16°37'.0	10	12'
POSKUS 1	Asterism	20h46m.4	+16°20'.0	9.6	6.5'
NGC 7006	Globular Cluster	21h01m.5	+16°11'.0	10.5	2.8'
TOADSTOOL	Asterism	21h07m.9	+16°18'.0	11	13'
NGC 7025	Galaxy	21h07m.9	+16°20'.0	12.8	2.1'×1.4'



The constellation of Dorado



Large Magellanic Cloud – Photograph: Johan Moolman

DORADO

A Misty Cloud on our Doorstep

Earth is a mere speck in the Milky Way and to try and imagine and represent it in perspective, is all but impossible. The soft band of the Milky Way is a reality that leaves one amazed but understanding little. Gazing southwards in favourable dark skies close to the end of the southern hemisphere summer we are able to see the two satellite Magellanic galaxies that revolve around our Milky Way.



The explorer Amerigo Vespucci noted the Clouds as early as 1503, but it was Ferdinand Magellan, the Portuguese explorer, who documented the Clouds in the 16th century and named them after himself in his report. Imagine for a moment the amazement and wonder such a sight would have produced in those early seafarers.

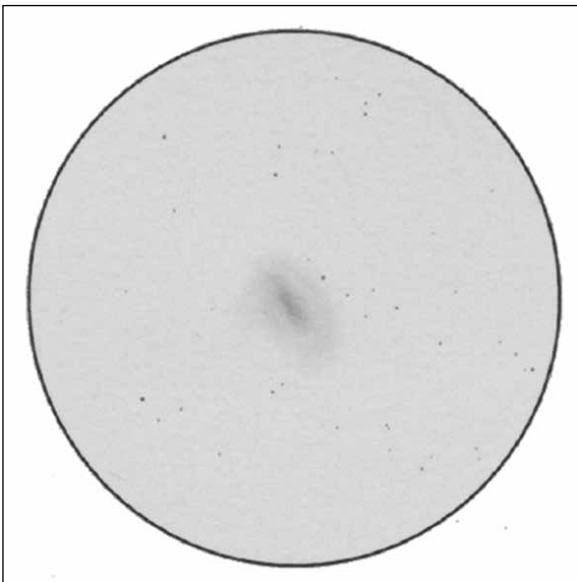
The Large Magellanic Cloud (LMC) forms an oval of approximately 6 by 4 degrees and astronomers classify it as a nearly face-on barred spiral galaxy, approximately 160 000 light-years distant. The larger part is situated in the constellation Dorado, with some overflow into the constellation Mensa. Despite the LMC's irregular shape, it displays a bar and one spiral arm, though somewhat distorted.

Edmond Halley, who arrived at the island of St Helena off the west coast of Africa in 1677, wrote that the Magellanic Clouds have the look of galaxies, and he observed small pieces of nebulosity and stars through his telescope. Halley noted three nebulae, which were probably the two dusty Magellanic Clouds and the Coal Sack.

Dorado the goldfish is one of the constellations named by Pieter Keyser and Frederick de Houtman during the years 1595-97 and was included in the 1603 catalogue of Johann Bayer. In 1598 the Dutch astronomer Petrus Plancius inscribed the constellation on the very first globe.

The South ecliptic pole (RA: 04h - DEC: -66°) lies within the constellation between eta and epsilon Doradus. The tail part of this tropical marine fish is projected through the magnitude 4.3 delta Doradus which is located in the far southern part of the constellation. Dorado, a slender figure about 179 square degrees long, is situated just north of the constellation Mensa the Table, named after Table Mountain in South Africa.

The star alpha Doradus, which can be seen perhaps as the eye of the goldfish is situated just 33' south of the galaxy **NGC 1617**, also known as Bennett 25a. NGC 1617 is not that difficult to explore – you just need some patience and a few tricks. Move alpha Doradus to just outside your field of vision, use high magnification and concentrate! The galaxy displays a soft, elongated east to west oval which gradually brightens to a star-like nucleus surrounded by an outer envelope. The eastern edge of the galaxy appears very misty and high magnification treated me to some visible surface character in the form of a few knotty areas. IC 2085 with a magnitude of 14 is situated 11' to the north.

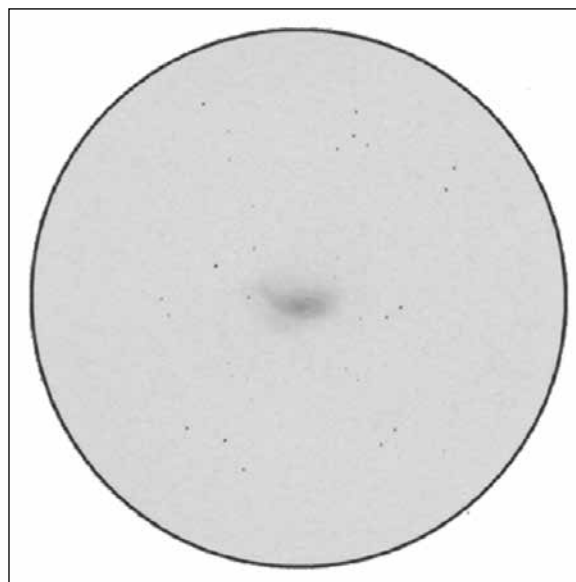


NGC 1566 - Galaxy

One of the most beautiful open spiral galaxies, **NGC 1566**, also known as Bennett 25, can be found among a number of other galaxies, also known as the Dorado Group, just 2 degrees west of alpha Doradus. The galaxy displays a large oval in a slightly north-east to south-west direction with a hazy fringe. The eastern and western parts are very flimsy and look like extended spiral arms. The large bright core displays a dense nucleus surrounded by a soft envelope. A few faint stars and dusty knots can be seen on the surface.

Another galaxy which is also part of the Dorado group is **NGC 1546**, situated barely a degree further south-west, close to the boundary with the constellation Reticulum. The galaxy displays a lovely, large, elongated oval in a north-west to south-east direction. The middle brighter area is large, with a soft outer halo that displays a good amount of nebulosity on the fringes. A magnitude 10 star close to the galaxy's western edge has a very faint magnitude 11 companion.

Between the fins of the heavenly fish, the galaxy **NGC 1672** can be spotted just 30' north of magnitude 5.2 kappa Doradus in the middle area of the constellation. The galaxy is an excellent example of a well-defined bar shape in an east to west direction showing off a bright pinpoint nucleus. Towards the eastern end of the bar a faint spiral arm can be glimpsed, extending northwards. This large relatively bright galaxy displays a very misty washed-out outer halo, more so towards the northern and southern ends.

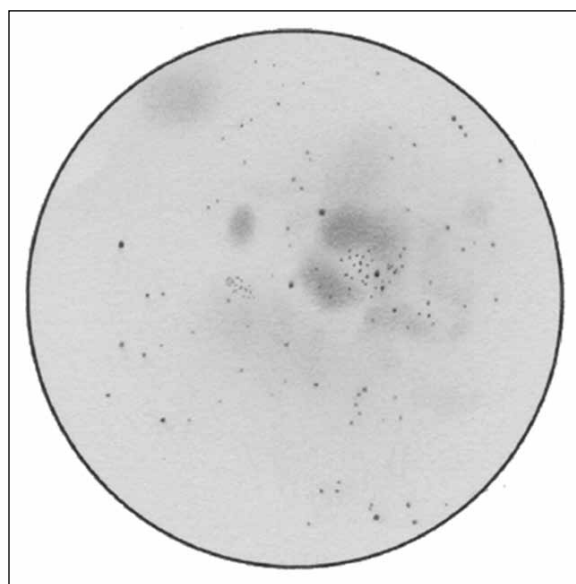


NGC 1672 – Galaxy

An outstanding red Carbon Mira star, R Doradus, which I strongly recommend observing, is situated 2.5 degrees south of kappa Doradus.

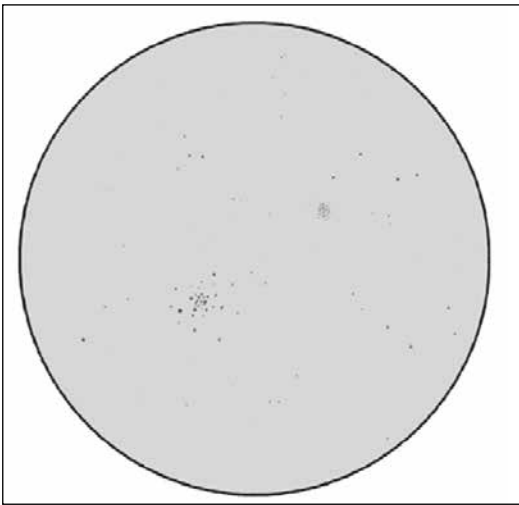
On the far northern edge of the LMC, a globular cluster pokes its nose up into the air out of the stormy sea. **NGC 1783**, also known as Bennett 28, is an outstanding object, slightly oblong in a north to south direction. This globular has all the parameters, becoming denser towards a compact centre with stars resolved over the surface and particularly with short star spikes on the outer edge. A few references classify this object as an open cluster.

A lovely, complex area permeated with clusters and nebulosity is situated just 30' to the south of NGC 1783. A few very bright, irregular pieces of nebulosity fill a field of nearly 20' and contain NGC 1760, 1761, 1763, 1769 and 1773. The focus of the complex area is **NGC 1763** towards the north-west, resembling a cocoon enveloped within a gas cloud, and also the largest and brightest object in the field of view. The cluster **NGC 1761**, situated just south of NGC 1763, displays approximately 20 faint stars, well resolved.



NGC 1763 ext - Nebulae

Against the very uneven, flimsy, nebulous complex **NGC 1760**, an emission nebula situated further south, displays a soft, hazy, extension with quite a few faint stars embedded. Situated to the north-eastern side of NGC 1760 and in the middle part of the area, the oblong emission nebula **NGC 1769** is part of the larger complex and impresses with its bright, dense appearance. The much smaller **NGC 1773** displays a round, quite bright patch of nebulosity just further north-west in the field of view, with just a few pinpoint stars in its midst. The quite impressive dusty field can even be observed through binoculars. Bear in mind that the size and magnitude of the emission and diffuse nebulae are very difficult to determine, because most of the index data differs.



NGC 1818 and NGC 1810
Open Clusters

The open cluster **NGC 1818** is situated only 50' to the east, also known as Bennett 30. It is rather impressive and resembles a small, bright, round hazy patch with a compact middle. With higher magnification stars of varying magnitudes form short strings within the outer regions of the cluster. I could spot the very faint glow of the unresolved smaller cluster **NGC 1810** about 6' to the north-west.

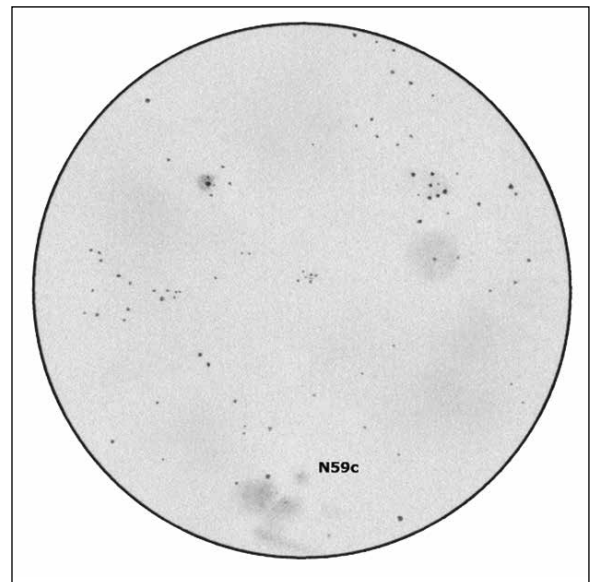
One of the easier and larger globular clusters to spot in the LMC can be found in the north-eastern extreme. **NGC 1978** displays a large oval that is quite bright with a very hazy impression. It could easily be mistaken for a galaxy. However, with careful observation, a few extremely faint stars can be detected on its surface. What makes observation a little difficult is that the object is embedded in the flimsy haziness of the surrounding field.

Further south and in the mist of the LMC is one of my favourite small open clusters **NGC 2004**. This group is situated 1.5 degrees east of the magnitude 4.8 gold-coloured theta Doradus. This cluster gives the impression of a comet core with faint stars flying away into a misty tail. The group displays short strings of stars with less activity towards the southern part. This is a very good example of where the field of view plays a role in the characterising of an object's impression. Around 8' to the south is a very small knot that could be an unresolved triple star.

NGC 1901, the very large, loose group of about 50 clearly visible stars and a handful of fainter ones is situated more or less in the middle area of the LMC. The cluster spans an area of more than 30'. It is a very easy noticeable group of stars to study through binoculars.

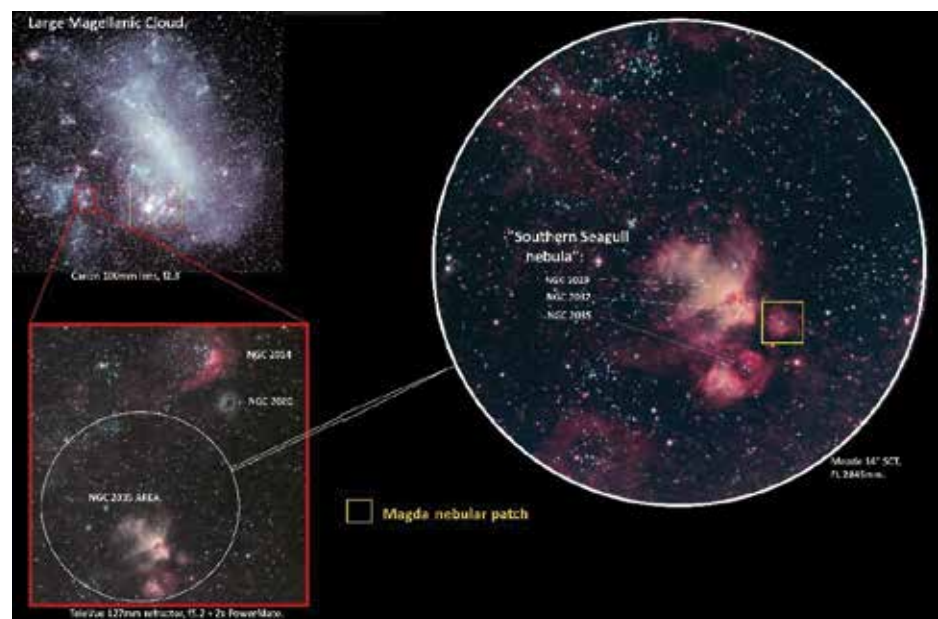
A rich area under the magnifying glass contains seven objects with **NGC 2032**, the larger and brighter uneven nebula in the field of view. **NGC 2035** is rounder, slightly fainter, with a few very faint stars embedded on the dusty surface. The two objects barely touch each other and form a well-defined figure. I pick up a small round patch of nebulosity just 2.7' south of NGC 2035.

All the nebulae in this area were brilliantly enhanced with an ultra-high contrast (UHC) filter. I was unable to find any data about this nebular patch, and a query was forwarded to Brian Skiff. He replied that the object was catalogued by Karl Henize in 1956 as LHa 120-N59C. It is centred by a magnitude 14.5 star that is obviously the star that lights up the circular nebula. The position of the star is: RA: 05h35.39.7 and DEC: -67°37'04".8 (J2000). In the same field of view the misty **NGC 2020** is situated towards the south of the above-mentioned objects. The emission nebula displays a soft, even, round glow, very smooth, that fades away into the field. The ignited star that fluorescence the nebula is relatively easy to see, and gives the impression of riding along on top of this glow. The magnitude 12.2 star on the southern end of the nebula is, however, a distracting factor, drawing the eye away. Nebulosity very much interweaves the lovely star grouping **NGC 2014**, about 5' west. And although small, **NGC 2011**, the relatively compact group to the north, is perhaps the brightest object in this field of view. **NGC 2021** displays an elongated scattering of faint stars in the far northern part of the complex, somewhat triangular in shape, with the triangle pointing south.



NGC 2032 ext - Nebulae

My dear friend
Johan Moolman
took this excellent
picture of the
nebulous complex,
outlited the
mysterious nebula
clearly.



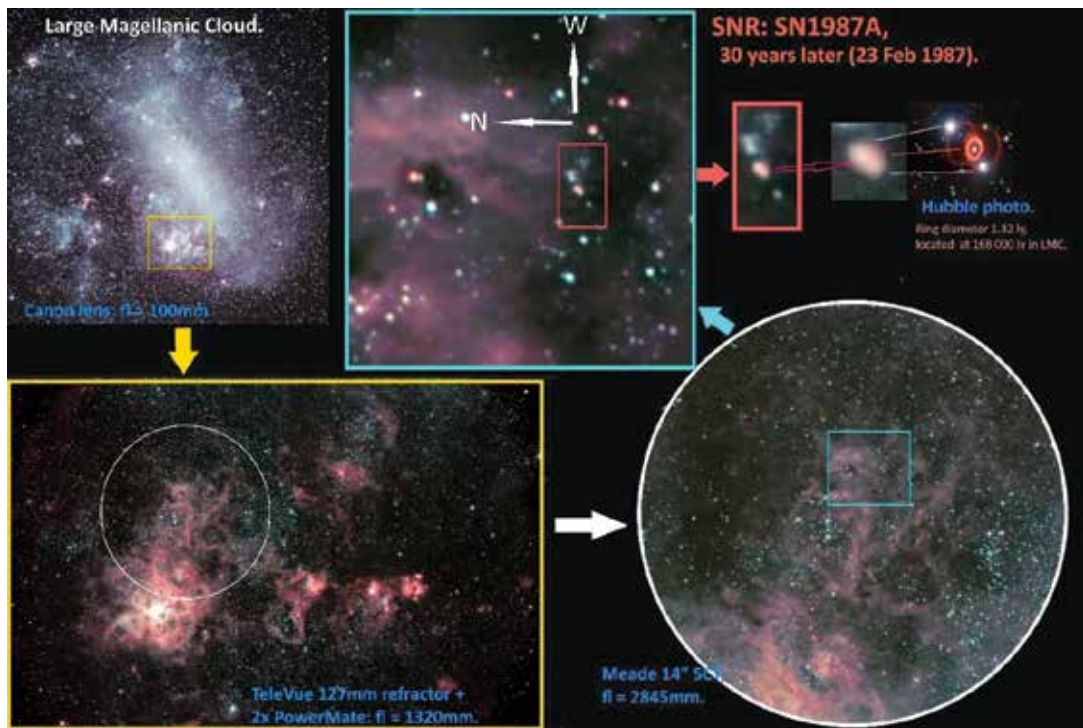
The Large Magellanic Cloud is home to **NGC 2070**, also known as Bennett 35, the great looped nebula situated in the south-eastern part of the LMC and probably one of the most amazing objects in the southern night sky. It is known as the Tarantula Nebula due to the striking similarity it shows to the tarantula spider, the largest arachnid of its kind in the world. It was discovered by Lacaille in 1751 and is easily spotted with the naked eye. The heart of the tarantula displays a tight and bright overwhelming core. Also known as 30 Doradus, it is situated approximately 190 000 light-years from earth, and is almost 600 to 700 light-years in diameter. Some astronomers believe that 30 Doradus is the nucleus of this neighbourhood galaxy, but it is not very centrally placed. This inner core consists of stars that are very hot and large. Their combined radiation is responsible for its brightness, especially the brilliant cluster R136, home to the recently discovered supermassive stars, several of which have masses well in excess of 200 solar masses. (*MNASSA* – Volume 69 Nos 11&12).

The Tarantula Nebula needs many words to describe it. This very large gas nebula which unfolds in long, soft, cloud-like arms, gently enfolded with dark, stripy inlays from a soft but overwhelming inner part. Nebulous gas trails and filaments extend beautifully in streaks of light that fade away and mingle with the dark of night. The southern part of the nebula is more complex, unfolding in a veil of misty haziness. The northern part appears tighter, and with a bit of imagination a large starry spider can be seen lurking in the nebulosity web. Star splinters dot the surface like dewdrops in the morning sun.

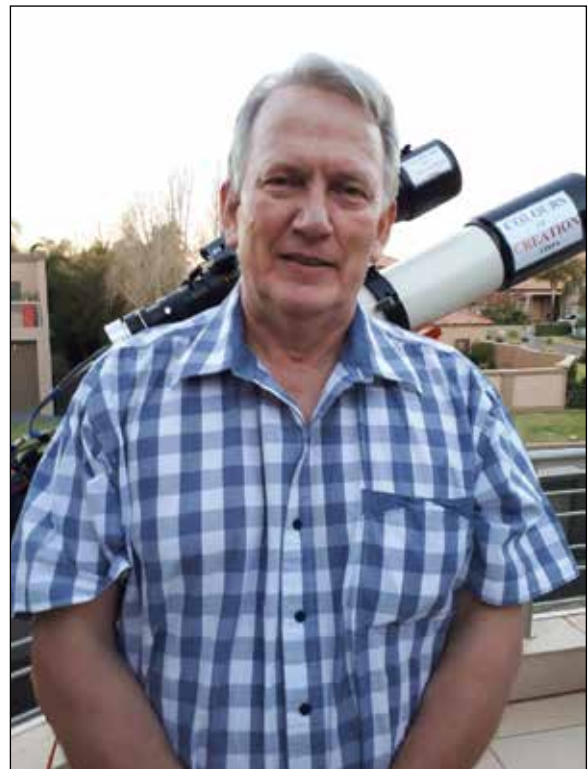


NGC 2070 – Tarantula Nebula – Photograph: Johan Moolman

Supernova 1987A, the titanic supernova explosion, was first observed on 23 February 1987 just to the south of NGC 2070. The star Sanduleak -69°202 was a magnitude 11.7 star before the outburst. It blazed with the power of 100 million suns and brightened up more than 2000 times than it was before. Although the supernova itself is now a million times fainter, light echoes are just beginning to show in the space surrounding it. Supernova 1987A was a blue super giant, with a core collapse that should have left behind a neutron star, but no evidence of that has yet turned up.



Johan Moolman's utter pleasure and joy are to share astronomy with friends, with regular visits to the pure clean Karoo night sky to produce high quality photographs through his telescope. He is an active member of the Pretoria Centre and contribute on various aspects of astronomy in South Africa. Always willing to contribute to various projects I might indulge in, thank you Johan.



DORADO – A Misty Cloud on our Doorstep



The name Bennett used in some of the descriptions in this chapter and elsewhere refers to Jack Caister Bennett, an accomplished amateur astronomer born on 6 April 1914 in Estcourt, KwaZulu-Natal, South Africa and who passed away on 30 May 1990. Astronomy friend Louis Piovesan is pleased to note that Jack Bennett was born in his little town and indicates to me that the name Estcourt derives from the Anglo-Saxon name Ecot.

Bennett was a dedicated South African comet-hunter who patrolled the skies in the late 1960s. He picked up a magnitude 9 supernova in NGC 5236 also known as Messier 83, becoming the first person ever to discover a supernova. He compiled the Bennett Catalogue, a list of 152 objects to help observers eliminate them in comet searches.

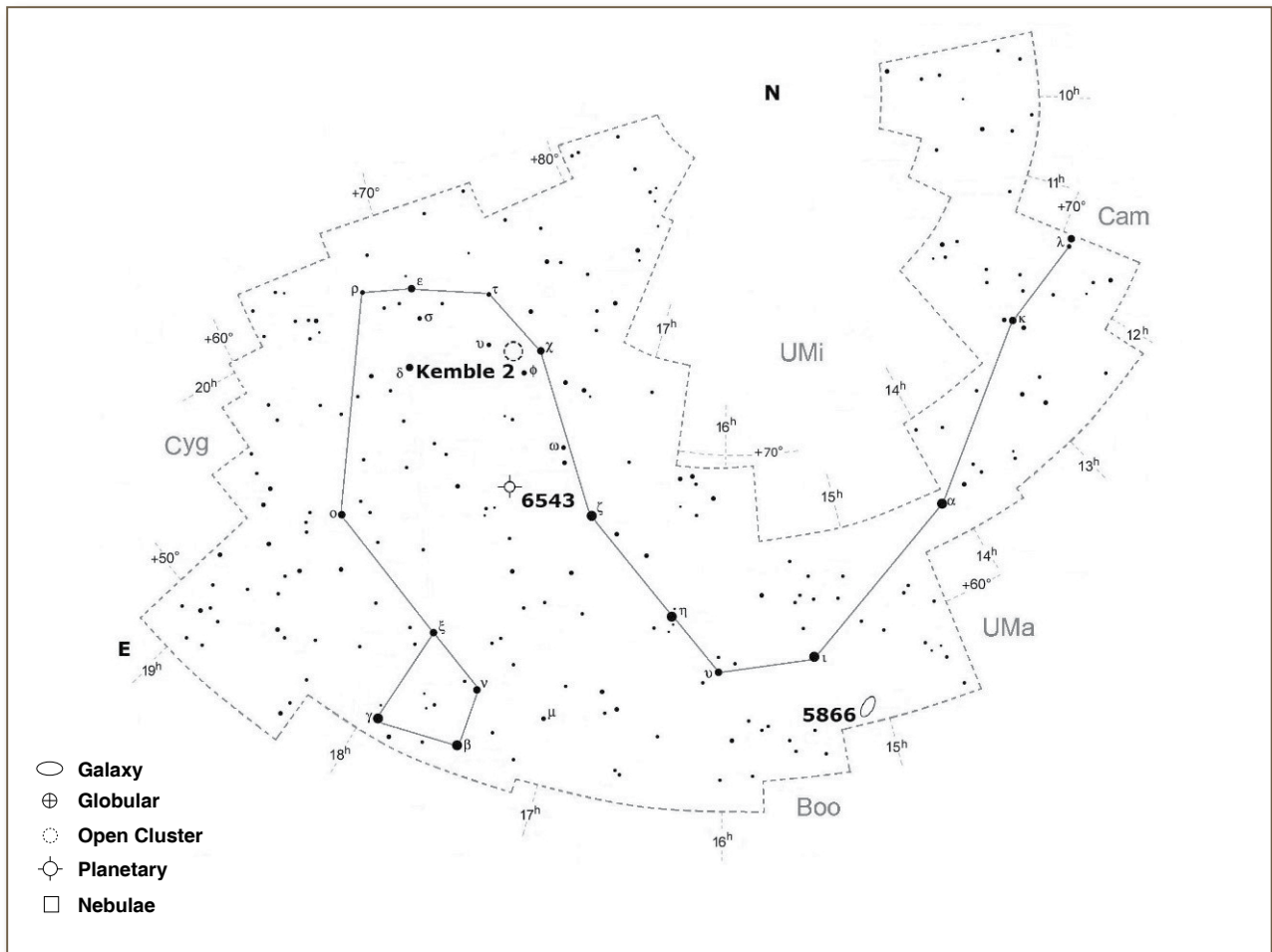
The constellation Dorado contains eleven Bennett objects:

- NGC 1549 (Ben 23)
- NGC 1553 (Ben 24)
- NGC 1566 (Ben 25)
- NGC 1617 (Ben 25a)
- NGC 1672 (Ben 26)
- NGC 1763 (Ben 27)
- NGC 1783 (Ben 28)
- NGC 1818 (Ben 30)
- NGC 1866 (Ben 33)
- NGC 2070 (Ben 35)
- NGC 2214 (Ben 36)



This is just the start of a journey of exploration through the misty LMC which weaves nebulae and stars into a fine network of art. Swimming around in the waters of the Cloud brings to the fore many knots of faint stars interspersed with nebulosity. Pick up your gear, your friends, your naked eye, and explore this wonderful front-door constellation which has so much to offer.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1546	Galaxy	04h14m.6	-56°04'.0	10.9	3.4'×1.7'
NGC 1566 Bennett 25	Galaxy	04h20m.0	-54°56'.0	9.4	7.1'×4.8'
NGC 1617 Bennett 25a	Galaxy	04h31m.7	-54°36'.2	10.5	4.8'×2.2'
R Doradus	Mira Variable Star	04h36m.8	-62°05'.0	4.8 6.6	Period 338 days
NGC 1672 Bennett 26	Galaxy	04h45m.7	-59°15'.0	9.8	6.2'×3.4'
NGC 1763 Bennett 27	Open Cluster Nebula	04h56m.8	-66°24'.8	8	5'×3'
NGC 1783 Bennett 28	Globular Cluster	04h58m.8	-65°59'.2	10.9	3'
NGC 1810	Open Cluster	05h03m.4	-66°22'.5	11.9	1.2'
NGC 1818 Bennett 30	Open Cluster	05h04m.2	-66°24'.9	9.7	3.4'
NGC 1901	Open Cluster	05h17m.8	-68°26'.0	7	40'
NGC 1978	Globular Cluster	05h28m.8	-66°14'.2	10.5	3.9'
NGC 2004	Open Cluster	05h30m.7	-67°17'.0	9.6	2.7'
NGC 2032	Emission Nebula	05h35m.3	-67°34'.0	10	3'
LHa 120-N59C	Reflecting Nebula	05h35m.6	-67°37'.1	14	1'
NGC 2070 Bennett 35	Nebula	05h38m.6	-69°05'.0	5	30'×20'



The constellation of Draco



NGC 5866
Photograph: Wikipedia



NGC 5457 – M101 – Ursa Major
Photograph: Hubble

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5866	Galaxy	15h06m.5	+55°45'.8	10.7	6'×5'
NGC 6543	Planetary Nebula	17h58m.5	+66°37'.8	9.8	20"
KEMBLE 2	Open Cluster	18h35m.0	+72°15'	6.2	12'

DRACO

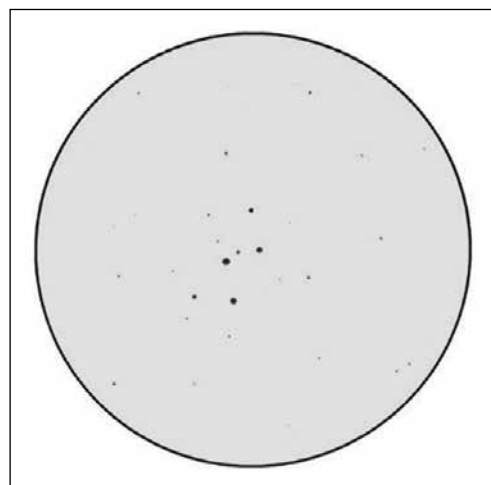
The Beast

Images of dragons were used for various reasons in the cultures of antiquity, some for more fear-inspiring purposes than others. The Draco constellation has a Greek origin. It is also seen as the shield of Hercules, but to be more kind, this winding figure is also seen as the ancient possessor of the North Pole Star.



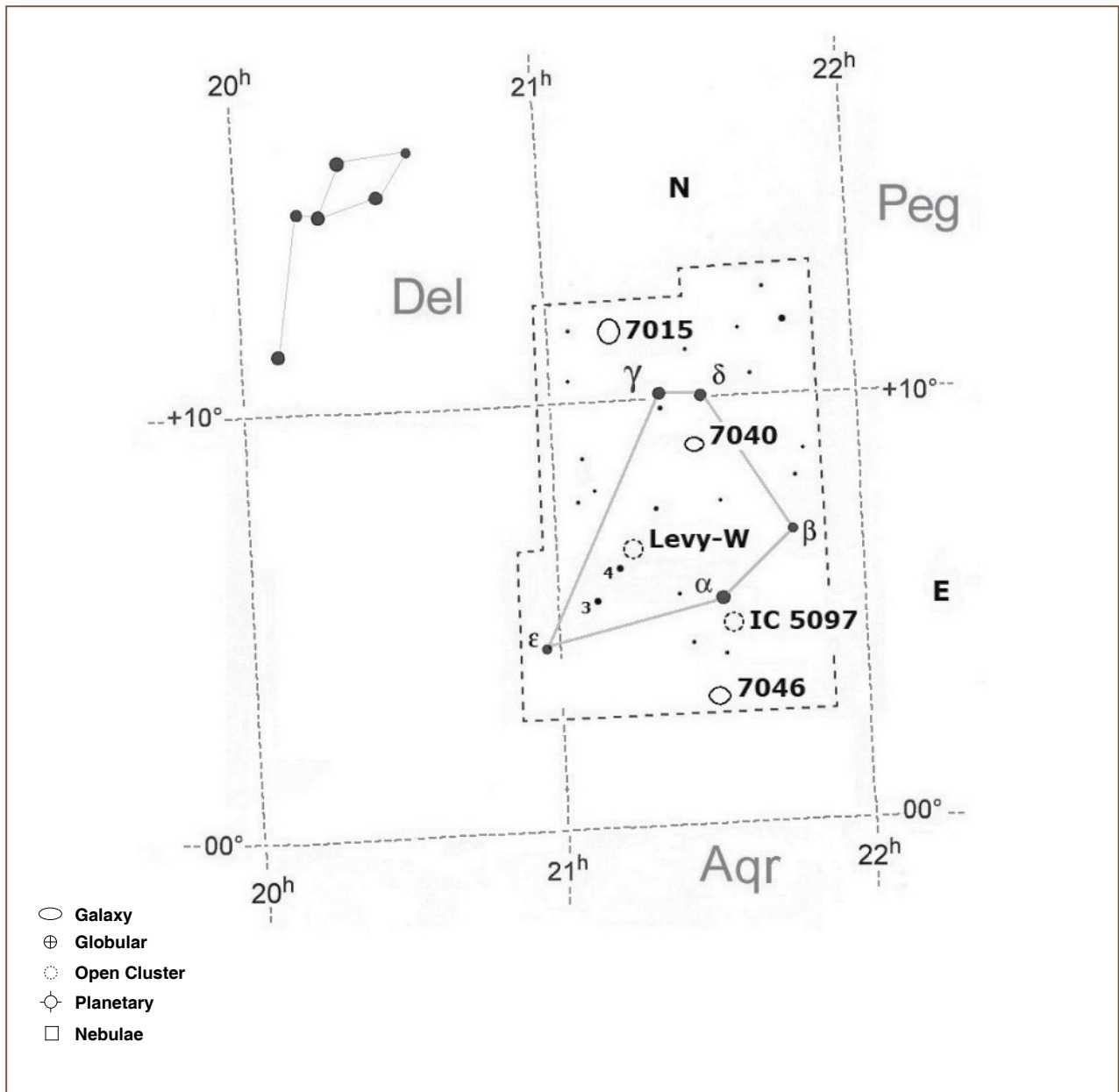
It is an enormous constellation, but one object that is truly exceptional within it is the planetary nebula **NGC 6543**, the so-called Cats Nebula. Even at first glance the beauty of this object can be clearly seen. The nebula is slightly oval, with a hint of a frosty blue play of light, not consistent in hues, but with contrasts. The edges appear lighter, with a slightly darker interior. Towards the western edge of the planetary nebula a bright spot indicates IC 4677 close to a 9.7 star. With suitable imagination one can see the association with the heavenly cat's eye, although it is 3300 light-years distant. NGC 6543 is almost exactly at the north pole of the ecliptic. A Hubble picture is the only way to appreciate the real depth of its beauty. The galaxy NGC 6552 is situated only 10' east.

At the curve of the Draco's long slender neck a starry crown can be seen. **KEMBLE 2** appears in the second edition of Uranometria 2000.0 and was discovered by Lucian J. Kemble. Five prominent yellow-coloured stars, together with a few fainter ones, stand out beautifully in the star field. The impression is clear that it could pass for a queen's crown, with the name quite fitting.



KEMBLE 2 – Open Cluster

NGC 5866 (or perhaps M102), is situated in the southern part of Draco, an ordinary, nearly edge-on galaxy, but the subject of some controversy. The galaxy is relatively small but bright, with a much brighter tiny elongated nucleus. This lovely streak of light also hosts a thin dust lane which can be seen with care and higher magnification. But what is the story revolving around this object and the more well-known Messier 101? Méchain announced his discovery of M102 as an error, declaring it to be the same object as the preceding number M101, the galaxy in Ursa Major. Méchain's original description of M102 matches far better the appearance of NGC 5866 in Draco than M101 and should have been easily seen by Méchain and Messier. M101 is a large, irregular open spiral galaxy gradually extending its light to the exterior, quite different from an edge-on galaxy.



The constellation of Equuleus

EQUULEUS

The Pony

In antiquity Equuleus represented the front leg of the larger constellation Pegasus the Winged Horse, or even that of a second, smaller horse. Equuleus is the second smallest constellation, at 72 square degrees just larger than the constellation Crux. The constellation forms a kind of square between the stars Pegasus and Delphinus, and one of the last constellations to be named. The Greek astronomers saw these stars up against the side of Pegasus as the front part. The Germans called it Kleine Pferd; the French named it Petit Cheval – both so descriptive.



Equuleus is not exactly a constellation one would get very excited about, but recognition should nevertheless still be given to it. The constellation is home to a few interesting double stars, a few galaxies and star groupings. Its corners are marked by alpha, beta, delta, gamma and epsilon Equulei.

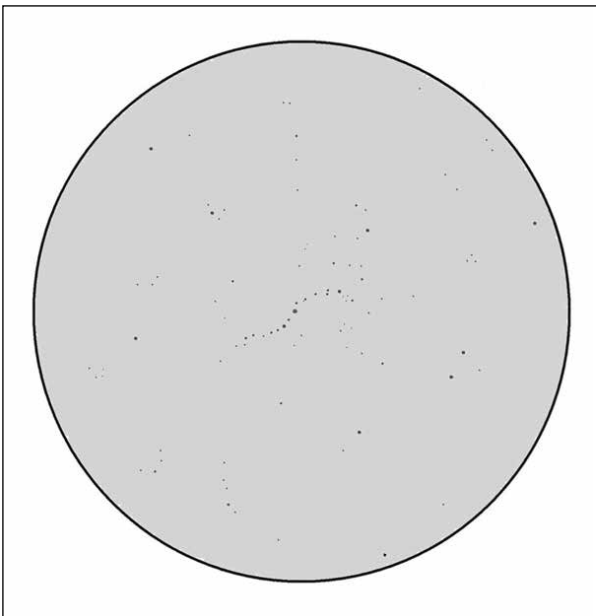
The southernmost corner star, epsilon Equulei is a triple star, the two main component stars, Type-F5, being magnitude 6 and 6.3, both displaying a pale-yellow colour. The separation is only 0.8", which is very difficult to split. The C companion shines in a pale blue with a magnitude of 7.1 in a position angle (PA) of 70° and separation of 10.7". The stars in combination create a rare colour contrast, which makes it a triple treat to admire, love and observe. The beauty of this double star is that you can even split the C companion from AB with only 30x magnification in any amateur telescope. It was discovered by Friedrich Georg Wilhelm Struve in 1835 and is about 200 light-years distant.

Forming the northern corner is the star delta Equulei, a binary with the AB in magnitude 5.2 and 5.3, but too close to split, with a revolution of only 12 years. The third C companion is a magnitude 9.4 with a separation of 47.7" in a position angle (PA) of 14°. It was discovered by Otto Struve in 1852. Some observers see the stars in the colour of sapphire and topaz. Each of the stars are about eight times the luminosity of our sun. A string of three field stars towards the east completes this pretty picture.



NGC 7046 - Photograph: In-The-Sky

On the southern border with Aquarius a group of galaxies cuts the constellations in half. The brightest galaxy in this close group is **NGC 7046**. Although at magnitude 13 it is difficult to observe. It is a spiral galaxy with a nice string of stars on its south-eastern edge. The galaxies in this group are IC 1362, IC 1364, IC 1365, IC 1366, IC 1367, IC 1368 and IC 1370. However, a degree east is a faint close grouping of a dozen magnitude 11 stars which truly give the impression of an open cluster.



LEVY-W - Asterism

Towards the middle area of the constellation the asterism **LEVY-W** can be found. Wendy Levy, who discovered this asterism, is the wife of the well-known David Levy, famous for searching comets. David Levy co-discovered of the comet Shoemaker-Levy 9 which collided with Jupiter in July 1994. Asteroid 3673 Levy was named in his honour. However, the S-shaped asterism was discovered in December 2000, named by them the "Equuleus S". The grouping can be found a degree north-east of the star 4 Equulei.

Mystery surrounds **IC 5097** barely 40' south of alpha Equulei. It might be only a quadruple star, with only four very faint stars in the range of magnitude 13. It is not listed as a galaxy.

Barely a handful of galaxies are scattered in this constellation. They are all very faint, but with a large telescope and dark skies some of them can be glimpsed if dedicated care is taken. **NGC 7040**, situated in the northern part of Equuleus, displays a smooth surface brightness with a glimpse of a hazy halo. In the south-eastern star field, a few colourful yellow stars are grouped together.

The star gamma Equulei is a very tight, double star of magnitude 4.7 and 11.5 with a separation of 1.9" and position angle (PA) of 86°. There could be a C companion with a magnitude 12.5 and D companion with a magnitude 5.9, also catalogued as 6 Equulei – perhaps debatable.

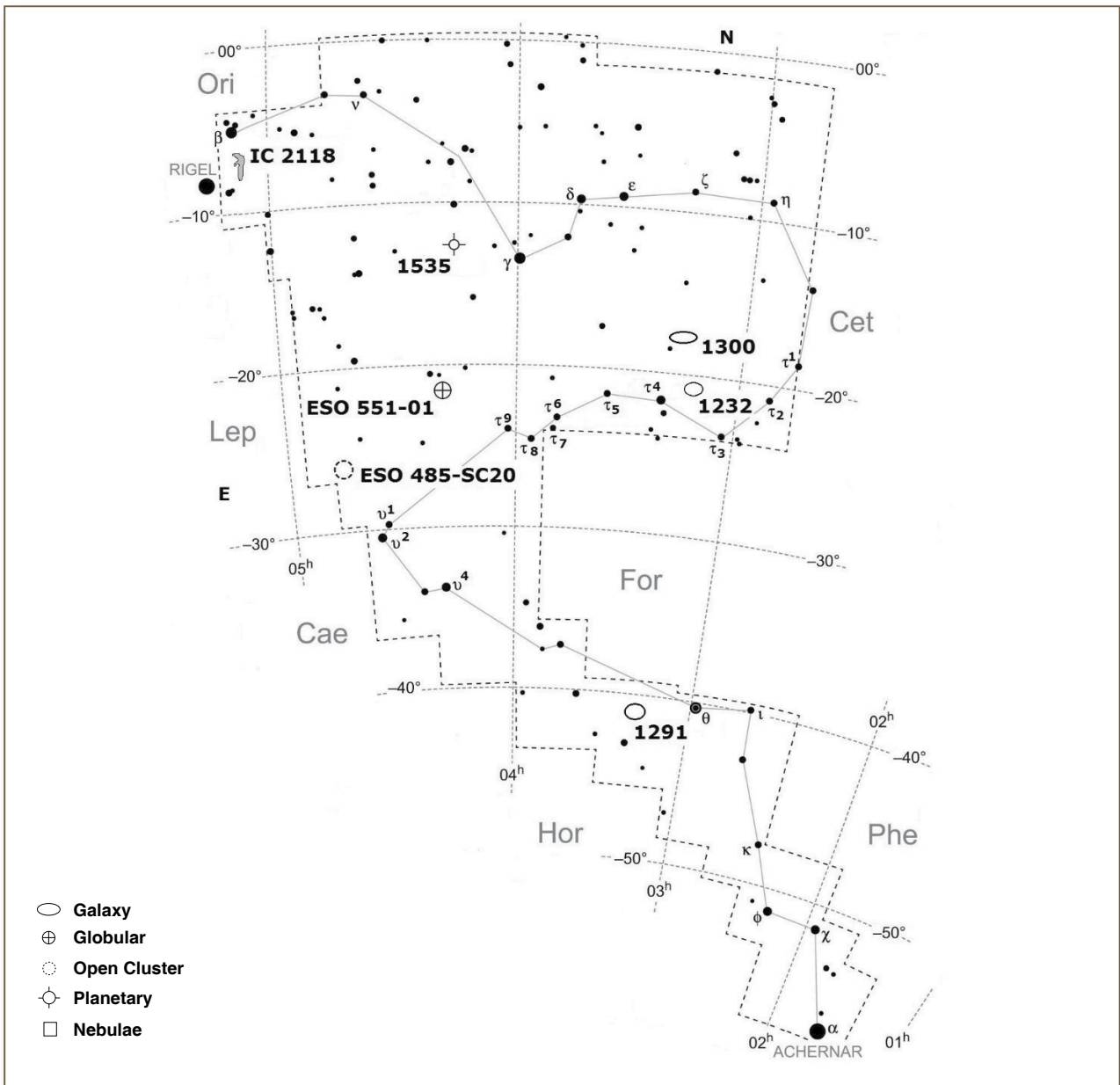
NGC 7015, situated close to the border with Delphinus, is a faint oval galaxy, slightly brightening up towards the middle. The Hubble picture shows an open spiral with a very dense nucleus. The galaxy pair with another fainter galaxy IC 5083, situated barely half a degree north. A string of magnitude 11 stars can be found 40' west of the galaxies. It contains a magnitude 8 yellow star on the southern tip with fainter stars stringing along north-east.



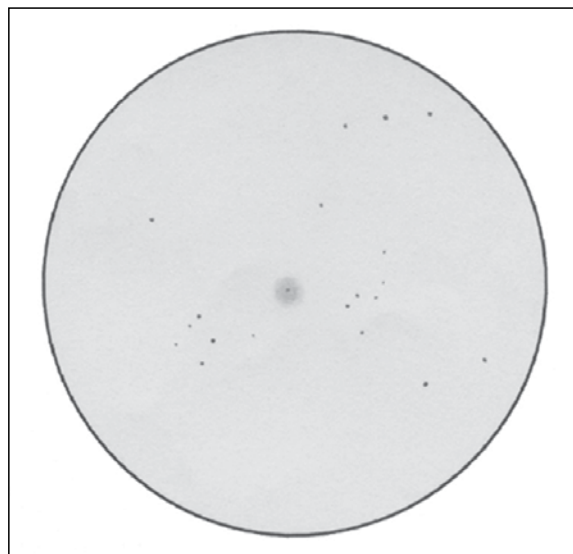
NGC 7015 – Photograph: Göran Nilsson
The Liverpool Telescope

Even though Equuleus is known only as a small pony against the starry night sky, you can still ride it to distant worlds.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 7015	Galaxy	21h05m.7	+11°24'.8	11.8	1.8'×1.6'
LEVY-W	Asterism	21h08m.4	+06°20'.5	8.5	22'
NGC 7040	Galaxy	21h13m.2	+08°50'.3	13.2	1'×0.7'
NGC 7046	Galaxy	21h14m.5	+02°50'.3	13	1.6'×1.4'
IC 5097	Quadruple Star	21h14m.9	+04°27'.9	12-13	*



The constellation of Eridanus



NGC 1535 – Planetary Nebula

ERIDANUS

Sail along on River Eridanus

One can truly be fascinated by the long-outstretched constellation Eridanus. It is also one of the largest star patterns against the starry night sky. History has it that Eratosthenes said that it represents the river Nile. It is the only starry river constellation flowing from north to south, and divided into a northern and southern stream. Except for the brilliant magnitude 0.53 alpha Eridani better known as Achernar, the 9th brightest star in the sky, this constellation has no stars brighter than magnitude 3. Follow the stream during southern spring months from Achernar, and it is easy to pretend that the starry river flows to the sea as beta Eridani with the last post of call still situated beyond the eastern horizon. Achernar (alpha Eridani) the end of the river, is a hot blue giant star, with luminosity 650 times that of the sun and 144 light-years from us. Eridanus is closely surrounded by the constellations Tucana to the south, Phoenix to the west and Horologium to the east.



Let's go on a cruise along this mighty river, departing from the star Achernar (alpha Eridani), situated virtually on the Hydrus border. From Achernar we sail along and pass the port-stars of chi, phi and kappa Eridani to stop and share time with the double star theta Eridani. This elegant white bright pair is easily split with a separation of 8.2" and a position angle (PA) of 88°.

The constellation Eridanus sports a multitude of galaxies along its shoreline. They are like faint glows of light nestled against the dark riverside, guiding us to stop at our first deep sky object **NGC 1291** also known as Bennett 12, approximately 3.7 degrees east of theta Eridani. It is a relatively bright medium size oval shaped galaxy that slowly brightens to a striking stellar nucleus. This elliptical galaxy, in a north-south direction, displays diffuse edges extended into a soft halo. With higher magnification a faint magnitude 12.5 star is just visible at the southern hazy tip. The galaxy can even be picked out with binoculars as a small hazy smudge under dark skies.

The starry river Eridanus flows close by the Fornax galaxy city situated on the north-west shoreline close to the magnitude 3.5-star upsilon Eridani. Sailing still further around the river bend, we head for the lonely open cluster **ESO 485-SC20**, virtually on the border with Lepus. At a glance, this cluster displays a triangle shape of more or less magnitude 8 stars. However, upon closer investigation, fainter members mingle well inside the northern part to give it a rounder and more open feeling to it.

Heading for deeper waters, the flow of stars now takes us in a westerly direction. We approach the "small T-bay" as I like to think about this part of the constellation. This area is surrounded by tau Eridani stars, with the variable star tau 8 Eridani as the beacon of light towards the south, forming a triangle with tau 9 and tau 7 Eridani. The star tau 8 Eridani is a lovely orange coloured variable star, and varies between magnitude 4.5 and 4.6 in less than 0.86 days.

Further west, the stars of river Eridanus flow into a busy harbour dotted with silvery ship-lights which we call galaxies. Part of the shoreline are eta, zeta, epsilon, delta and the lovely magnitude 2.9 gamma Eridani at the far eastern end of this unmistakable bay.

NGC 1232 is situated 2.5' north-west of tau 4 Eridani and displays a relatively large, round shimmer of light with a hazy outer halo. A small stellar oval nucleus can be seen shrouded in nebulosity. This open spiral, a true light beacon, displays an uneven disc with low surface brightness. It also has a very uneven dusty edge gradually fading into the star field with the eastern side somewhat flimsy and hazy. With really high magnification, a few faint stars can be spotted on the dusty surface, and with careful observation and averted vision, specks of brighter dust knots can be detected on its surface. The small companion galaxy NGC 1232A is situated on the eastern side of the parent galaxy. The field of view is rounded off with a magnitude 9 yellow coloured star about 8' to the east.

One of the constellation's most popular galaxies is situated just inland about 2.5 degree north-east from NGC 1232. The galaxy **NGC 1300** is probably the best-known example of a barred spiral and notably elongated in an east-west direction with a nucleus bar that extends almost the whole length of the major axis. It is advisable to search out dark skies and high magnification to study this special galaxy.

Turn to the star epsilon Eridani and ponder for a while: it is the nearest star which is reasonably similar to the sun, therefore it might well be expected to have a planetary system. However, it is less luminous and slightly cooler than our sun, but it is still comparable enough to be promising.

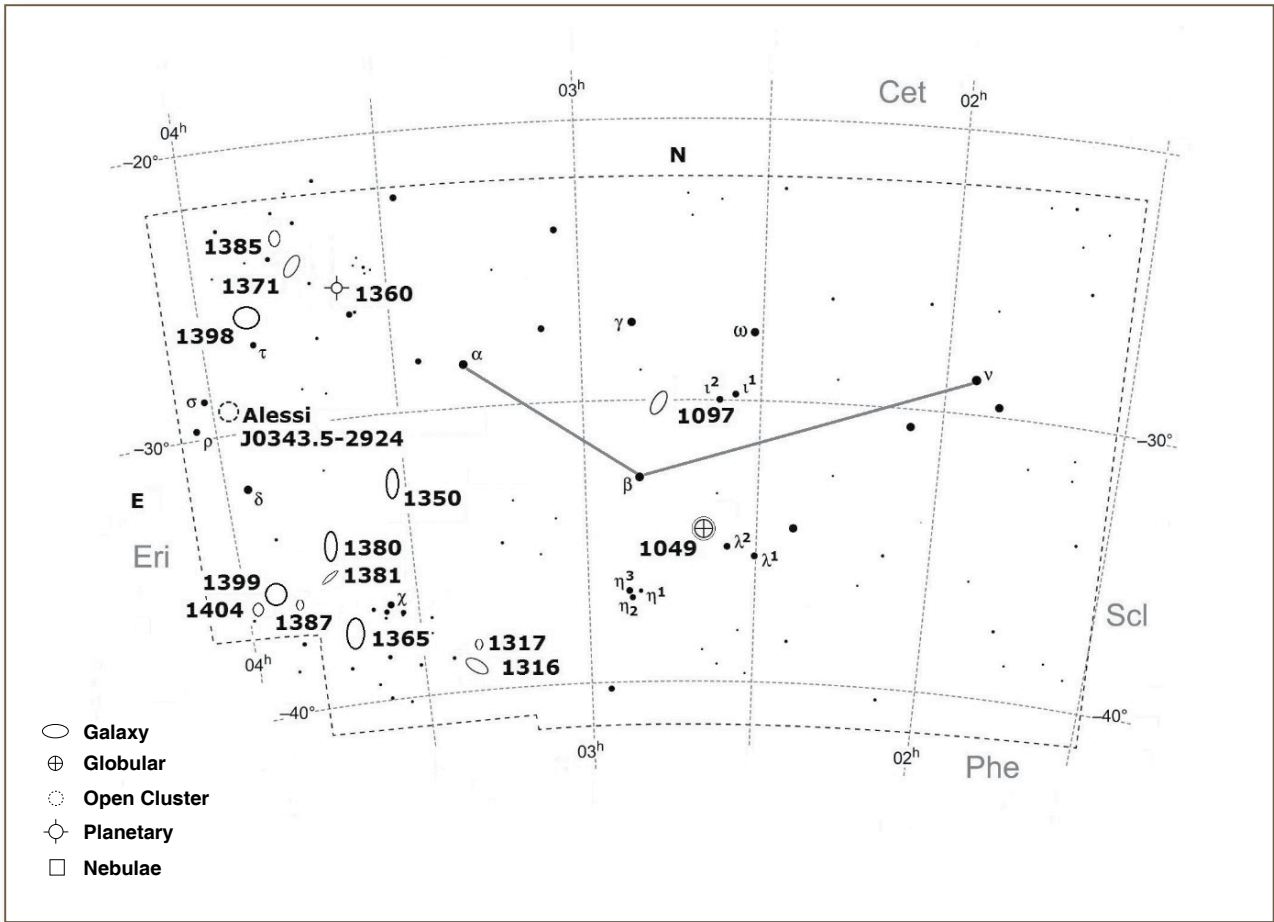
Back in the open waters, the planetary nebula **NGC 1535**, also known as Bennett 22, is situated on the home straight. This remarkable planetary nebula shows a small, bright defined round shape with a frosted look and blue coloured hue. Higher magnification brings to the fore uneven layers of nebulosity, and a cloudy milky edge. The northern portion is somewhat more defined compared to the southern side, which appears fuzzy. The central star which is magnitude 12 is a fairly easy target.

If you want to swim in really deep waters, try the very faint globular cluster **ESO 551-01**, situated approximately 9 degrees south of NGC 1535. I could only guess, as I saw it as a very faint and dim object with averted vision.

As we approach beta Eridani at the end of our cruise, the shoreline towards the constellation Orion is seen shrouded in a cloud of mist. The very difficult to observe **IC 2118** is a faint, misty north-south reflecting cloud, also known as the Witch Head Nebula. The nebula shines by reflecting light of the star Rigel situated 2 degrees east in the constellation Orion.

Don't just cruise along River Eridanus, stop at its ports, discover and observe the brilliant deep sky objects on display.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1232	Galaxy	03h09m.8	-20°35'.0	10	6.8'×5.6'
NGC 1291	Galaxy	03h17m.3	-41°08'.3	8.5	11'×9.5'
NGC 1300	Galaxy	03h19m.7	-19°25'.0	10.4	5.5'×2.9'
NGC 1535	Planetary Nebula	04h14m.2	-12°44'.0	9.6	18"
ESO 551-01	Globular Cluster	04h24m.5	-21°11'.3	13.5	1'
ESO 485-SC20	Open Cluster	04h50m.4	-25°57'.8	8	5'
IC 2118	Reflection Nebula	05h06m.9	-07°13'.0	9+	180'×60'



The constellation of Fornax



This old Ray-burn stove does not cook up galaxies but it was a great way of preparing good food in the olden days

FORNAX

An Oven full of Fuzzies

The constellation Fornax was previously known as *Apparatus Chemicus*, translated as *Chemischer Apparat*, *Chymischer Ofen* and *L'Apparat Chimique* in 1782, in honour of the celebrated chemist Antoine Laurent Lavoisier. These titles for the constellation have, however, fallen into disuse for the constellation and only the name *Fornax the Furnace* has stuck (*Star Names: Their Lore and Meaning* – Richard Allen).

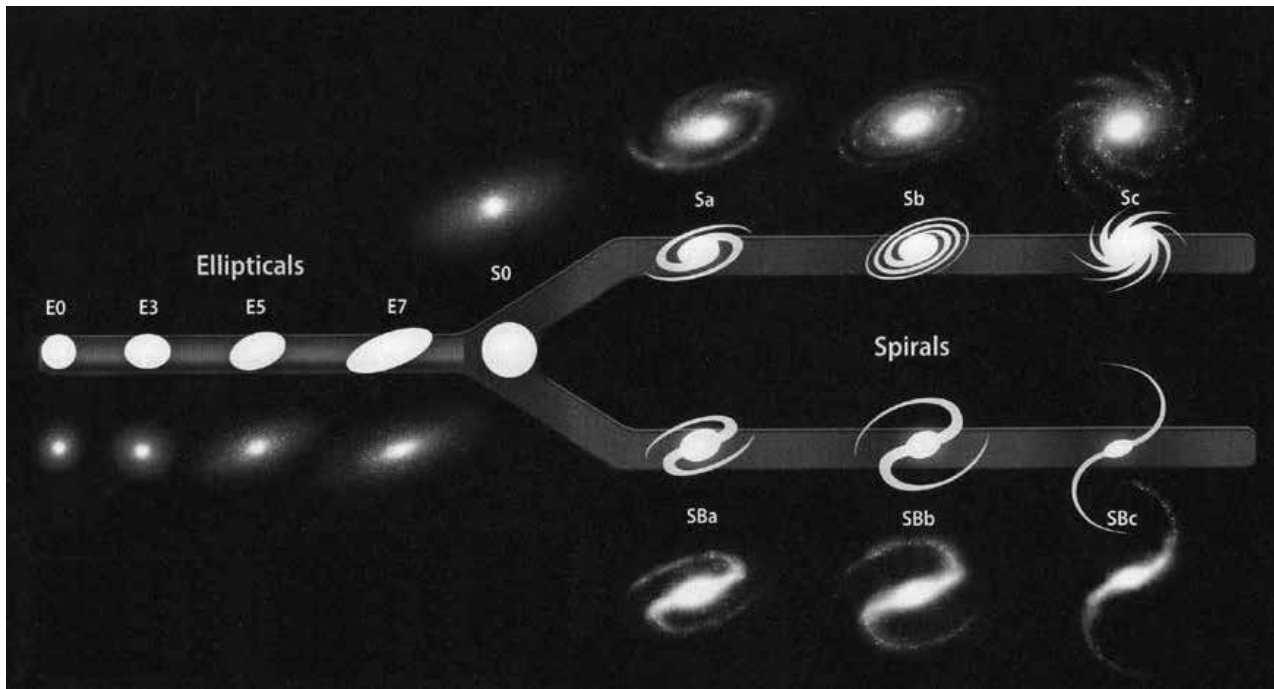


It is a constellation that is generously blessed with galaxies and is not at all reluctant to share them with us. The constellation Fornax is situated west of Eridanus and east of Sculptor, which are also situated in a galaxy-rich part of the starry skies.

Gaining an understanding of galaxies by just talking about them, or thinking about them, is not always very successful and can bring about confusion. Observing them sometimes seems to be even more difficult, but when you succeed in doing so, it is very satisfying.

As a warm-up exercise, let us first illuminate the panorama with omega Fornacis, a close pair of suns, fairly bright with a separation of 11" and position angle (PA) 237°. The primary has a lovely yellow-white colour, while its fainter companion reflects as a light grey-blue. The combination of colours makes this pair quite outstanding, and not shy to share a southern field of view encircled by galaxies.

If you aren't ready yet for galaxy pie, then have a look at iota Fornacis, situated 2 degrees south of omega, a beautiful, wide, buttery-yellow pair, shining with stars of magnitudes 5.7 and 5.8.



The Hubble's model with ellipticals on the left, lenticulars in the middle (S0) and both kinds of spiral galaxies on the right. This model classifies galaxy shapes, making it easy to deal with the different types.

A closer look at the constellation reveals that it is liberally strewn with galaxies, a real challenge to take on. Everything is there: from stately spirals and giant ellipticals in different classes, to barred, edge-ons, ring galaxies, irregulars and the more unfamiliar early types of lenticulars.

A familiar galaxy to find is more or less in the middle area of the Fornax oven's shelf. **NGC 1097** is situated 2.2 degrees north of the orange-coloured beta Fornacis. Also known as Arp 77 and Bennett 10, the galaxy displays an elongated and diffused barred spiral, extending from the north-west to the south-east, with a bright bar-shaped nucleus that works up to a stellar point. Towards the north-western rim of the galaxy the companion galaxy NGC 1097A is barely seen as a dusty patch. With very high magnification and perhaps with larger than average amateur telescopes, traces of spiral arms can be seen as soft wisps of haze streaming outwards from the eastern and western sides. A triangle of three attractive yellow magnitude 10 stars is visible slightly to the south. NGC 1097 is also a Seyfert-type galaxy, and in deep photographs has revealed four narrow optical jets.

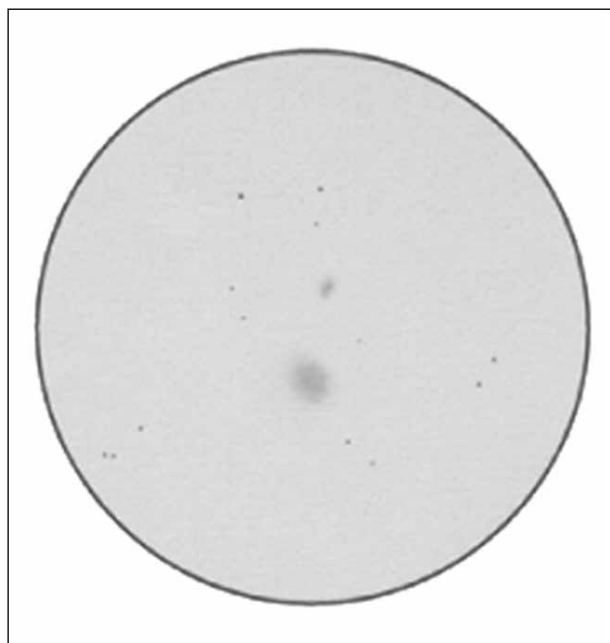
Feeling brave now? Then try a first run on the trio galaxy group IC 1858, IC 1859 and IC 1860 situated just a degree south-east of NGC 1097.

Halton Arp interpreted these jets as manifestations of the currently weak active nucleus. Studies show that the jets are in fact composed of stars and could well be the shattered remains of a cannibalised dwarf galaxy. Arp is known for his 1966 catalogue, *Atlas of Peculiar Galaxies*, which lists 338 examples of interacting and merging galaxies.

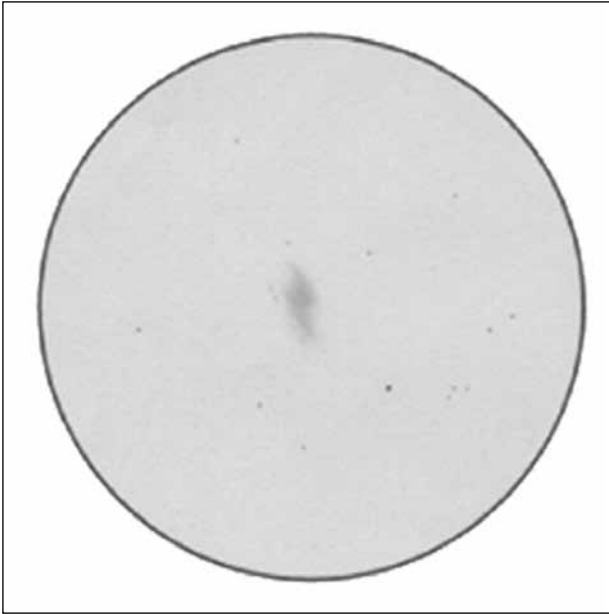
The Fornax Dwarf Galaxy, catalogued as ESO 356-G4, is situated barely 40' north-east of lambda Fornacis. A tough nut to crack is the extragalactic globular cluster **NGC 1049**, situated inside the northern part of this dwarf galaxy. The object truly has the character and hazy look of a galaxy, but I doubt whether anyone can resolve any stars in this object. It was discovered by John Herschel in 1835, but the parent dwarf galaxy was not discovered until 1938 by Harlow Shapley's assistant Sylvia Lindsay, who also found the Sculptor Galaxy Cluster. Do not miss out on the beautiful trio companion stars eta Fornacis, situated 2 degrees south-east.

The easiest way to the Fornax Galaxy Cluster is to locate chi Fornacis in the midst of galaxy world towards the far south-eastern part of the constellation. The area is home to about 28 NGC galaxies, 15 found by John Herschel, 7 by Julius Schmidt, and 6 by James Dunlop. The south-western flank of the Fornax Galaxy Cluster weaves around **NGC 1316**. It is also a lenticular galaxy with unusual dust lanes and is about 70 million light-years away. The galaxy is also known as Arp 154 and Bennett 14. This object is an active giant radio-galaxy with a super-massive black hole, known as Fornax A, which has been feeding on a remnant it cannibalised.

NGC 1316 is slightly elongated in a north-east to south-west direction. The companion galaxy **NGC 1317**, on the northern tip of NGC 1316, much smaller, round in shape, and brighter towards a sharp, dense core. It would not be strange if NGC 1316 eventually absorbed NGC 1317. A few faint stars between the two galaxies connect the pair beautifully.



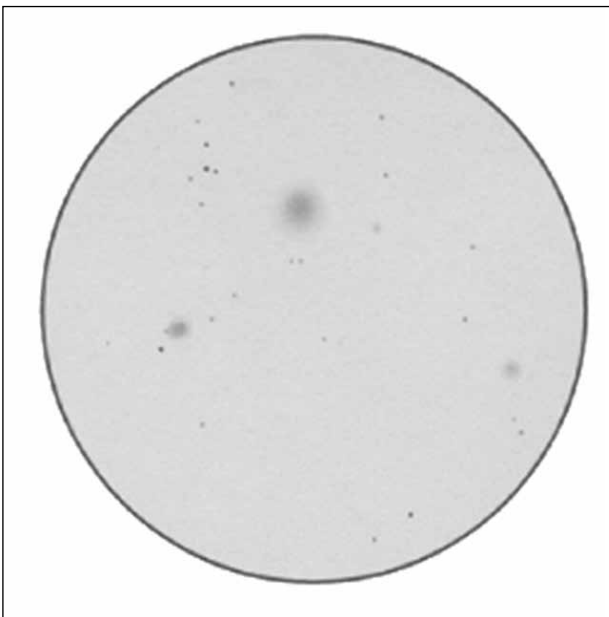
NGC 1316 and NGC 1317 – Galaxies



NGC 1365 – Galaxy

The treat of this galaxy swarm in Fornax is the dozens of star cities that can be seen dotted about in the background around **NGC 1365**. The galaxy is also known as Bennett 16. Although it displays a low surface brightness, the bar lines up beautifully from east to west, with a relatively bright small nucleus. Higher magnification, however, brings to the fore the barely visible flimsy arms of this spectacular object. The arm from the western end fades towards the north, while the other arm stretches from the east in a southern direction. Both arms decrease in brightness towards the edges, with

the western arm perhaps better defined. NGC 1365 could possibly be seen as the shape of our own Milky Way.

NGC 1404, NGC 1399 and NGC 1387
Galaxies

In the heart of the Fornax Cluster, is **NGC 1399**, situated north-east of NGC 1365 and appears as one of the largest and brightest elliptical galaxies. It displays a hazy outer envelope and brightens gradually towards a large core and tight prominent nucleus. A faint star superimposed on the northern edge of the core region lends a completely different look. The galaxy is located some 65 million light-years from us.

Astronomers using the Chandra X-ray Observatory have discovered an intermediate-sized black hole in NGC 1399, ripping a star to shreds. The

shredded debris shows spectral lines of oxygen and nitrogen, but no hydrogen – a sign that the disrupted star was a white dwarf.

The galaxy **NGC 1404**, is situated only 8' to the south-east of the large galaxy NGC 1399 but more than half its size. Although small, it displays with pride a quite bright circular glow and dense core, beautifully rounded off with a red-coloured magnitude 8 star about 2' toward the south.

Barely 20' further west, another elliptical galaxy **NGC 1387**, occupies a spot in this crowded cooking oven full of fuzzies. Although rather small and faint, it displays yet another round ball of light, brightening to a star-like nucleus. The galaxy is also known as Bennett 18 and with higher magnification displays a hazy outer envelope. This rich group of galaxies could be as far as 45 000 light-years away. NGC 1387 and NGC 1379 were described by John Herschel in the year 1835 as globular clusters.

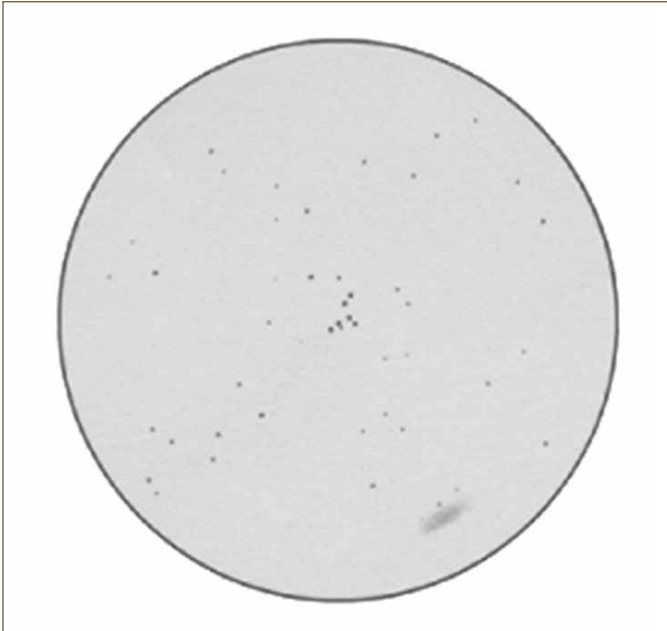
The edge-on galaxy **NGC 1381** finds its home 25' north-west of NGC 1399. It displays a slightly stretched-out ellipse from north-west to south-east with an obvious centre.

A fat, oval-shaped galaxy **NGC 1380** is situated further towards the northern edge of the galaxy group, very elongated in a north-south direction. It is an impressive moderately large galaxy gradually brightening to an almost star-like nucleus. NGC 1380A is situated only 15' further north. Three more galaxies, NGC 1373, 1374 and 1375, approximately 20' to the south-west, form a fine group. This area is dotted with galaxies and the best way to explore it, is to use a detailed star map in excellent dark starry skies.

Trace some of the galaxies in the excellent photograph supplied by Dieter Willasch.



Just outside and towards the north of this dense and rich galaxy field is the somewhat lonely member, **NGC 1350**. It is a beautiful oval shape galaxy, displaying a dust lane stretching in a north-south direction, and gradually brightening to a small but very bright nucleus. A slight, flimsy haziness can be glimpsed towards the western edge. A very faint star is situated in the southern tip of the galaxy.



ALESSI J0343.5-2924 – Asterism
and NGC 1425 – Galaxy

Bruno Alessi discovered an asterism known as **ALESSI J0343.5-2924** in the eastern part of the constellation 30' towards the west of sigma Fornacis. The group displays a modified letter J with a few approximately magnitude 9 yellow-coloured stars. The top bar is towards the south and also houses a double star. The grouping stands out well against the starry field situated also half a degree west from the galaxy NGC 1425.

The Two-Tiered Spiral galaxy, perhaps better known as **NGC 1398**, can be found in the north-eastern part of the constellation. This large round spiral galaxy displays a relatively high surface brightness and brightens evenly to a compact dense nucleus with the edge displaying a hazy outer envelope. Very high magnification is needed to glimpse the outer spiral arms responsible for its nickname.

Interestingly, astronomers pushed the NASA/ESA Hubble Space Telescope to its limits when they found a very dim and tiny object in Fornax called UDFy-39546284, which is likely to be a young compact galaxy. The object existed 480 million years after the Big Bang, only four percent of the universe's current age. More than a hundred such mini-galaxies would be needed to make up our own galaxy, the Milky Way. Its light will have travelled for 13.2 billion years to reach Hubble telescope, which corresponds to a red shift of around 10. The age of the universe is more or less 13.7 billion years old (NASA/ESA).

What a nice surprise to find a bright and eye-catching planetary nebula just a degree north-west from NGC 1398. Known as Robin's Egg Nebula, **NGC 1360** is a large irregular planetary nebula that displays an oval glow in a north-south direction. With careful observation and higher magnification, it shows an uneven texture with a slightly brighter northern region. Also known as Bennett 15, this object is bathed in a pale, washed-out grey colour and hosts a magnitude 10.5 centre star, visible with careful observation. An attractive white-coloured magnitude 6 star is situated approximately 20' to the north-west of this planetary nebula. NGC 1360 was Lewis Swift's first discovery, made in 1859 with his private 4.5" refractor in Rochester, NY. The nebula was independently found by Wilhelm Tempel in 1861 with a 4" refractor in Marseille.



NGC 1360 – Photograph: J. Drudis and G. Goldman

One of the northern-most NGC galaxies in Fornax are **NGC 1371**, also listed as NGC 1367 (slightly confusing!), situated only a degree north of the above-mentioned planetary nebula. The galaxy displays a very hazy oval, relatively large with a slightly brighter nucleus. What makes this galaxy special is the pair of orange-coloured stars situated close to the north-eastern edge. NGC 1371 was discovered by William Herschel in 1784 and was found a second time by Ormond Stone in 1886. Dreyer was not aware of this identity and catalogued Stone's object as NGC 1367. Thus, by priority, it should be named NGC 1371.

The last galaxy to be discussed in this very special constellation is barely 30' south of the border with Eridanus. **NGC 1385**, like so many other galaxies, displays just a faint oval haze against the background star field. It appears elongated in a north-south direction, brightening gradually towards its nucleus. The colourful star field comes as a bonus and complements the galaxy in a very special way.

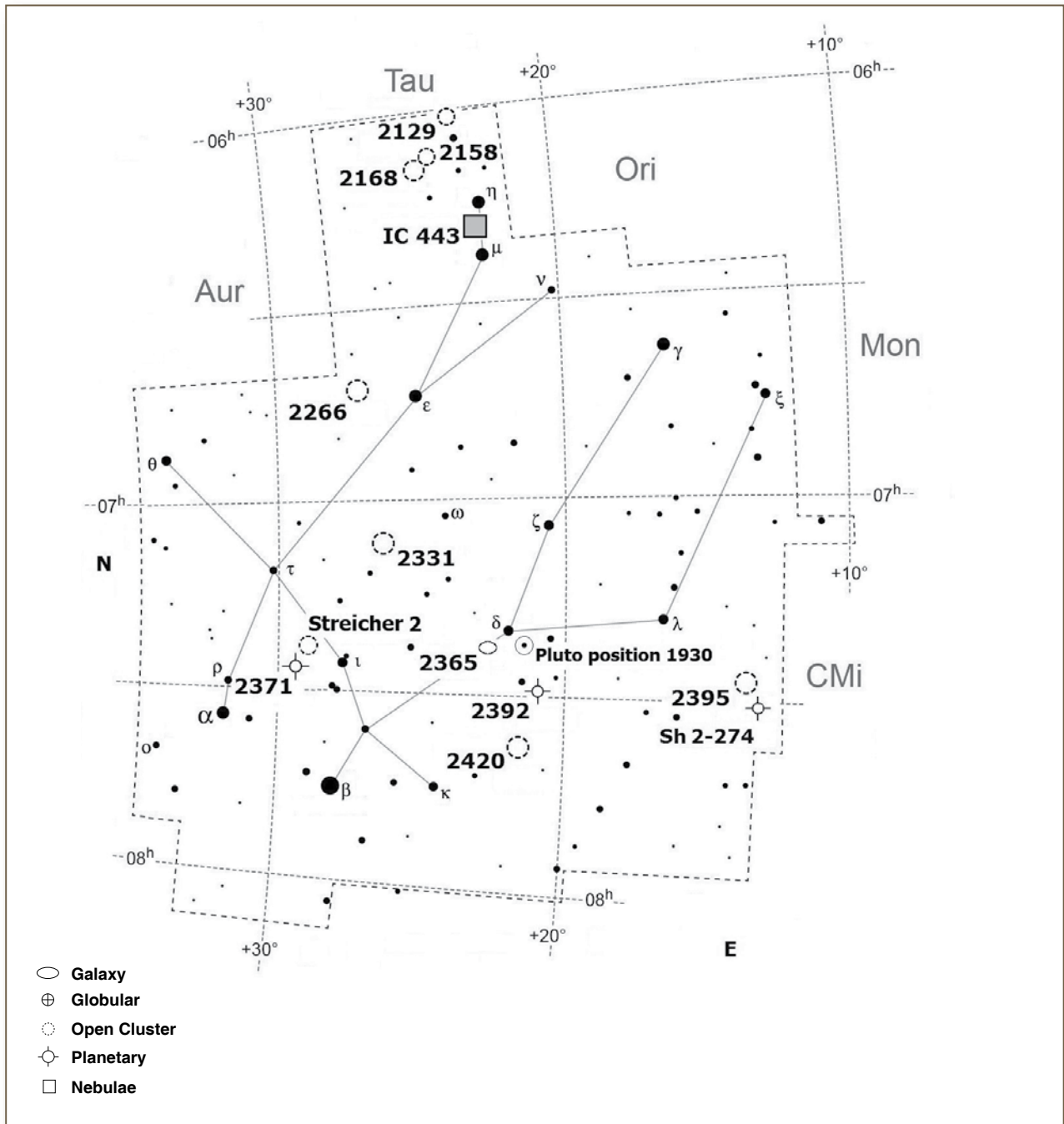
You were warned that there are many fuzzies cooked up in this chemical oven! What a delightful journey through this galaxy world to be able to discover and explore these misty, distant Milky Ways.



Edwin Powell Hubble – Pencil Sketch: Kathryn van Schalkwyk

Edwin Powell Hubble was born in Marshfield, Missouri, on 20 November 1889. He studied law at Oxford, but soon turned to astronomy as a graduate student at the Yerkes Observatory of the University of Chicago. Hubble developed a classification system for extragalactic structure based on the design of a cosmic “tuning fork” diagram. He died of a heart attack in San Marino, California, on 28 September 1953. The famous Hubble Space Telescope was named in his honour.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1049	Extragalactic Globular Cluster	02h39m.7	-34°17'.0	12.9	4'
NGC 1097	Galaxy	02h46m.2	-30°14'.5	9.2	10.5'×6.3'
NGC 1316	Galaxy	03h22m.7	-37°12'.0	8.2	13.5'×9.3'
NGC 1317	Galaxy	03h22m.8	-37°06'.1	10.8	3.5'×3'
NGC 1350	Galaxy	03h31m.1	-33°38'.0	10.3	6.2'×3.2'
NGC 1360	Planetary Nebula	03h33m.3	-25°51'.3	9.4	390"
NGC 1365	Galaxy	03h33m.6	-36°08'.0	9.3	10.9'×6.5'
NGC 1371 NGC 1367	Galaxy	03h34m.7	-24°56'.2	10.6	4.9'×3.4'
NGC 1380	Galaxy	03h36m.5	-34°59'.0	10	4.8'×2.8'
NGC 1381	Galaxy	03h36m.6	-35°18'.0	11.5	2.6'×1'
NGC 1387	Galaxy	03h37m.0	-35°31'.1	10.8	3.1'×2.8'
NGC 1385	Galaxy	03h37m.5	-24°30'.0	10.7	3.6'×2.4'
NGC 1399	Galaxy	03h38m.5	-35°27'.0	8.8	8.1'×7.6'
NGC 1404	Galaxy	03h38m.9	-35°35'.4	9.7	4.8'×3.9'
NGC 1398	Galaxy	03h38m.9	-26°20'.0	9.5	7.1'×5.2'
ALESSI J0343.5-2924	Asterism	03h43m.5	-29°24'.9	8	16'



The constellation of Gemini

GEMINI

Two of a Kind

Twins of any kind are always fascinating, and a twin constellation is no exception. Not that it's in any way comparable with twins as we know them on earth. These heavenly twins are not identical, but do share some of the most splendid deep sky objects. When the constellation makes its appearance in the east, we see the twins comfortably standing on their heads, somewhat low against the northern horizon as seen from the southern hemisphere. Writing about the Gemini constellation is one big joy ride through space, as it is extremely rich in a variety of exceptional deep sky objects, although it is a pity that some are on the fainter side.



The constellation comes into view towards the end of the year, with the western twin displaying its head star, the well-known double alpha Geminorum, better known as Castor. William Herschel analysed measurements of this star taken over a period of a century and proved that Castor's two bright components are orbiting each other, confirming the first evidence that gravity operates outside our solar system. The visual binary was discovered in 1678, with the components being magnitude 2 and 2.9 respectively, and the separation 6" with a revolution period of around 467 years. Each of the components itself is a spectroscopic binary, making Castor a quadruple star system with its six individual stars gravitationally bound together. Castor is quite close to our solar system at only 51 light-years distant. To trace the twins from head to foot is fun, and obviously easier when they are both higher up towards the night sky. This zodiacal constellation was also known in antiquity as the Sons of Zeus, named Castor and Pollux, and is a most striking constellation, worth getting to know better.

Appearing to be kneeling at the heavenly twins' feet is a well-known and favourite open cluster, none other than **NGC 2168**, perhaps better known as Messier 35, situated 2.5 degrees north-west of the magnitude 3.3 eta Geminorum. This outstanding star cluster, which, in dark sky conditions, can be seen even with the naked eye, is splendid in appearance. The various magnitude stars in this grouping represent a truly amazing sight. Through a telescope, however, the eye will immediately be drawn to a more prominent, bright string of stars with a yellow-coloured magnitude 7 star at its north-eastern end.



NGC 2168 – M35 – Photograph: Dale Liebenberg

Star strings and dark voids can easily be seen, and with higher magnification dozens of faint pinpoint stars are filling in the gaps. This is a bright, colourful cluster – and believe it or not, it is nearly 20 light-years in diameter, and about 2800 light-years away, which is fascinating.

The bonus, however, is to spot the small, faint companion open cluster, **NGC 2158**, situated barely half a degree southwest from M35. This faint smudge of light is more than six times further distant than its companion M35. However, with care and higher magnification it can be resolved in a tight, star-rich grouping.



NGC 2158 – Photograph: Dale Liebenberg

Further west is the very young cluster **NGC 2129**, a lovely object and a favourite amongst amateurs. Two bright super-white stars dominate the heart of the grouping that stands out beautifully against a field of fainter stars. Strange, but true, is the fact that this cluster has also played the game with an outstanding twin impression. It is divided by a dark void that runs from east to west between the two magnitude 7 and 8 luminaries. The northern part of the cluster seems slightly more crowded with fainter stars. Tom Campbell sees the letter D in the overall shape of this cluster.

Further east, between the star's eta and mu Geminorum, faint nebulosity fills the field of view. Closer to the point is **IC 443**, a nebula not seen without a huge amount of effort. However, you need pitch-dark skies, nebula filters, and a dark cloth over your head with a lot of good luck and faith, and even then, you could not be sure of spotting this filter haze. The brighter north-eastern shell of the nebula is more popularly known as the Jellyfish Nebula and might be the remains of a supernova occurrence thousands of years ago. The nebula spans nearly a degree between the two stars, but I suggest you rather admire the two beautiful stars, which both display a lovely orange colour. Deep photography of the nebula reveals what has to be one of the most beautiful objects, with a delicate lace impression.

Down the left leg of the son Castor, and about a degree and a half north of magnitude 3 epsilon Geminorum, is the small open cluster **NGC 2266**. This is a story-telling grouping of stars. It contains stars of various magnitudes, giving the impression of a feathery hat. Brighter stars mark the rim from north-east to south-west ending with the brighter magnitude 8.9 star at the south-west tip. A handful of faint stars spread out randomly to the west like feathers. It is apparently a very old cluster which is rather faint but very beautiful.

Another cluster worth a visit is **NGC 2331**, about 5 degrees east of NGC 2266. A rather loose grouping with quite a mixture of magnitude stars, but what impressed most is a small, really pretty half-circle of faint stars situated in the northern part with a triangle of stars towards the south side.

At the bend of brother Pollux's leg is a special spot between its host stars. The controversial planet Pluto was discovered on a photographic plate by the young Clyde W. Tombaugh on 18 February 1930 at the position of RA: 07h21m02s - DEC: +21°55'24", barely 15' south-east of delta Geminorum. To pinpoint this famous spot, first find the easily seen magnitude 11 double stars just 5' south-east from delta Geminorum. Another 8' south-east will bring up a triangle of three faint stars which were the silent companions just south of the position of planet Pluto on the night of its discovery. But things change in the world of science and poor little Pluto has now been demoted to only the status of a dwarf planet; however, fortunately for Pluto, it is still one of the largest objects in the Kuiper Belt. Pluto was named by an 11-year-old girl, Venetia Burney of Oxford, who suggested the name from the Roman God of the underworld.

The galaxies in Gemini are all mostly faint, but a relatively easy one to find is **NGC 2365**. While still in the neighbourhood of delta Geminorum and 30' towards the north-east, the galaxy shares this historic star field. The rather faint spiral is not much more than a faint glow, but still worth a try if you can shift the bright delta Geminorum to the side of the field of view.

Approximately 2.3 degrees south-east of delta Geminorum is one of the best-known, much-discussed and well-loved planetary nebulae. The beautiful object **NGC 2392**, discovered by the great William Herschel in 1787, is probably better known as the Eskimo Nebula. It is also sometimes referred to as the Clown Face Nebula, which indeed shows lovely character in displaying a double shell around a bright inner part. It is easily seen with the use of a telescope, although from the southern hemisphere there could be low horizon disturbances. NGC 2392 is a worthwhile object to observe, with its number of dark patches that truly resemble a face of sorts. The flimsy outer edge clearly hints at the furs on the Eskimo's hat. The nebula is about 4200 light-years distant and the remnant star will eventually collapse to form a white dwarf. Friend Dana Patchick had this to say about the Eskimo Nebula: "It is tough to top the view for sheer frightening detail that was seen of the 'Eskimo' in the Mount Wilson 60-inch reflector one fine evening. I say 'frightening' because it reminded me of looking into the maul of the 'planet killer' for those of you that remember that Star Trek episode, The Doomsday Machine."



NGC 2420 – Photograph: Mittel

In a slender triangle to the east with NGC 2392 and kappa Geminorum the rich open cluster **NGC 2420** displays several stars packed into a rather small area. The bulk of many fainter stars spread outwards into the north-eastern field of view. This cluster could contain as many as 50 members or perhaps more. A brighter curved string of stars is slightly more outstanding towards the outer southern part of the grouping. What a lovely open cluster to adore.

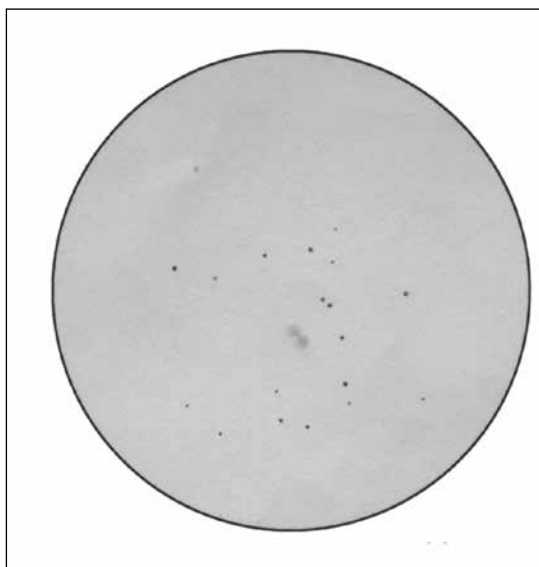
Another twosome shares half a degree field of view only 1.3 degrees north of the constellation Canis Minor. The open cluster **NGC 2395** displays a loose overall triangular shape point towards the north, with faint stars scattered randomly throughout. A very short string pointing south-west seems to be connected to the group.

The partner in this twosome is the indicated object **Sh 2-274**, also known as Abell 21. Perhaps not so familiar, but the Medusa Nebula, situated only 35' south-east of NGC 2395, certainly rings a bell. The faint crescent-shaped haze filters out in a soft filamentary nebulosity towards the north-west. With a sharp eye in excellent dark skies and a somewhat larger telescope, dark voids maybe glimpsed.



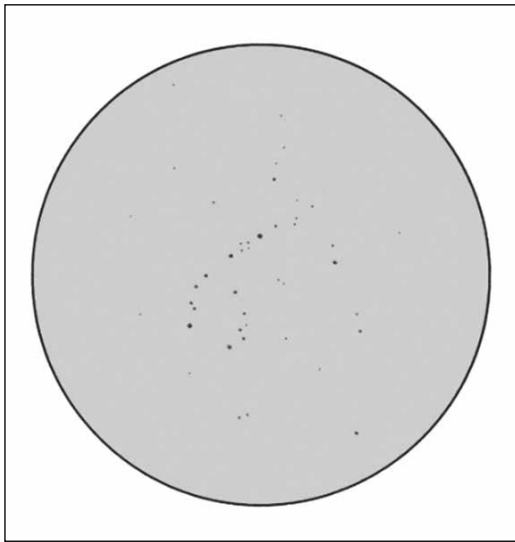
Sh 2-274 – Photograph: Dale Liebenberg

One of my favourite objects is the planetary nebula **NGC 2371/2372**, which can be found in a triangle to the west with alpha and beta Geminorum, or, if you prefer, the well-known stars Castor and Pollux. With the so-called Gemini tradition in a way, this object is a double-lobed planetary nebula which had the appearance of two separate objects, for which two entries were, therefore, given. When intensive photos are studied, one gets the impression of the nebula hidden inside a chocolate paper wrapping.

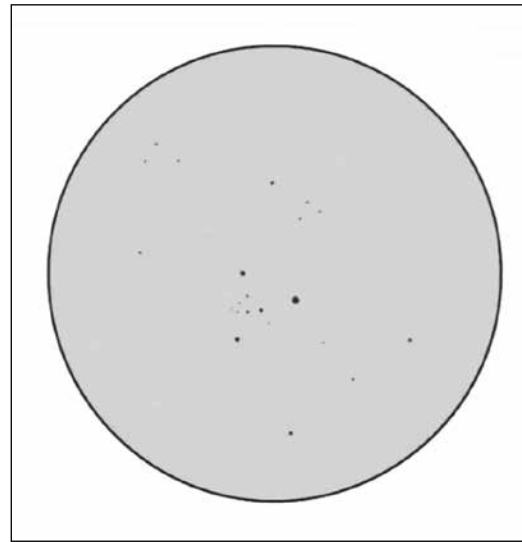


NGC 2371/2372 – Planetary Nebula

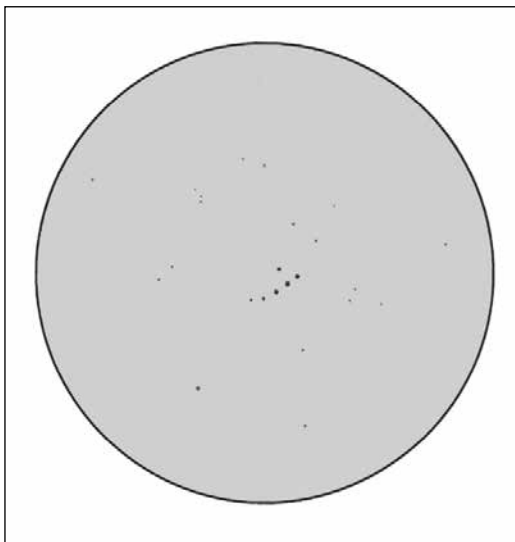
Unwrap this heavenly chocolate, and two circular patches of nebulosity straddle their magnitude 13.3 central star, the remains of a sun-like star. The lobes of nebulosity appear almost within touching distance with averted vision. The south-western lobe is slightly brighter and with the help of an (O-III) filter the nebulosity of both lobes extends into a see-through haze.



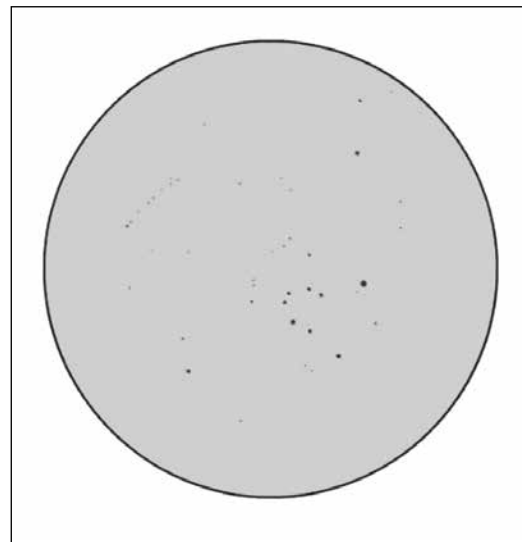
Streicher 1 – DSH J0658.6+2919
RA: 06h58m.6 – DEC: +29°19'.5



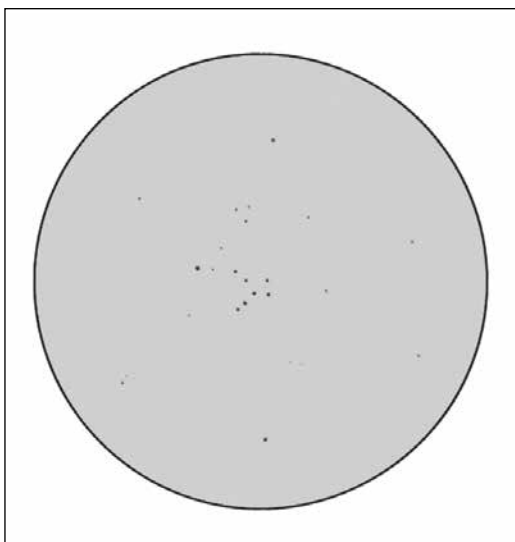
Streicher 3 – DSH J0729.0+3425
RA: 07h29m.4 – DEC: +34°25'.4



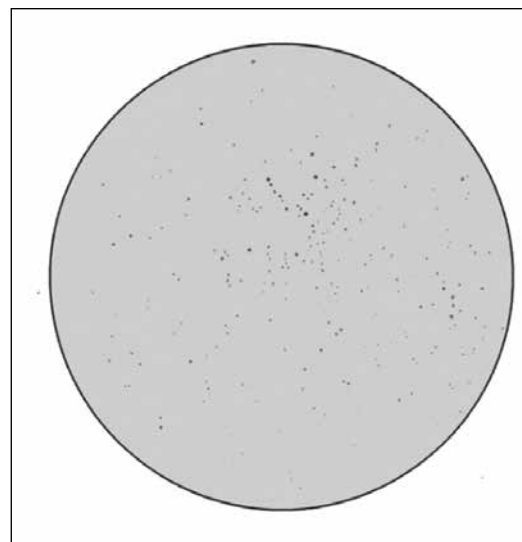
Streicher 4 – DSH J0748.6+3422
RA 07h48m.6 – DEC: +34°22'.2



Streicher 25 – DSH J0654.8+2854
RA: 06h54m.8 – DEC: +28°54'.9

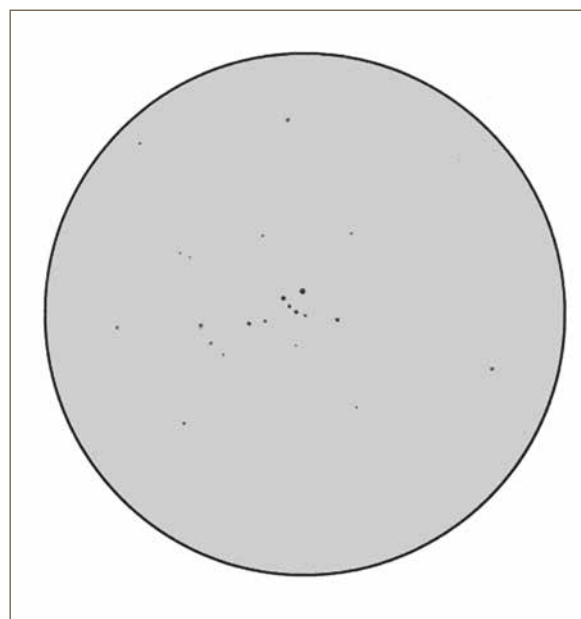


PATCHICK 46
RA: 07h36m.1 – DEC: +33°58'.8



NGC 2168 and NGC 2158
Open Clusters

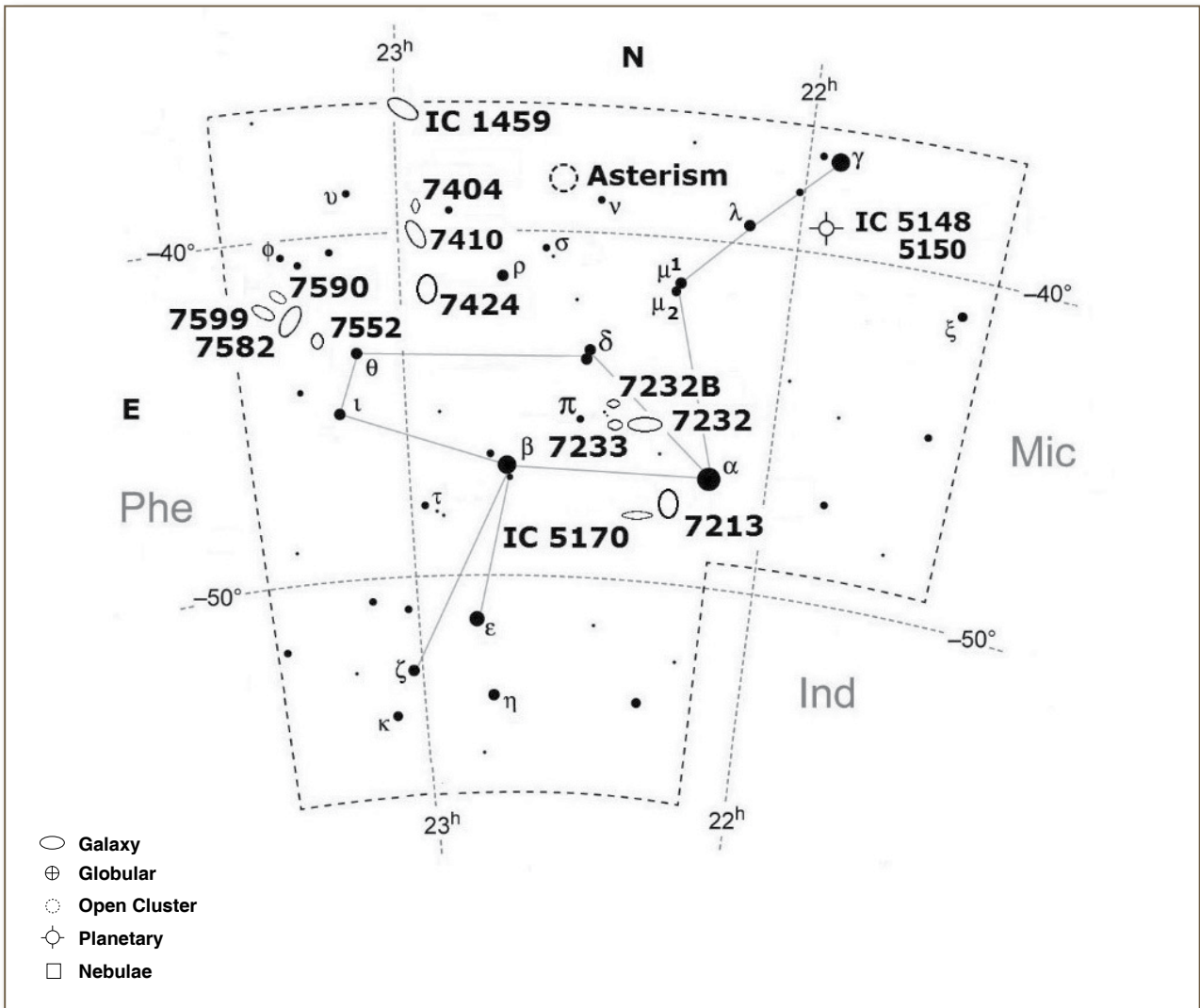
I end with a reference to another asterism, **STREICHER 2**, barely half a degree south-west of NGC 2371/2372. This small group displays an exquisite and dainty shape. It is quite outstanding against the background star field with the brighter magnitude 9.7 star towards the north. The first impression is a few stars from north-east to south-west in an uneven curve. Another short string can be seen towards the east.



STREICHER 2 – Asterism

When next you are lonely, take out your close friend, the telescope, or a pair of binoculars, and bond with the twins, while realising that they will always remain part of the great unknown.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2129	Open Cluster	06h01m.1	+23°17'.3	6.7	6'
NGC 2158	Open Cluster	06h07m.5	+24°05'.8	8.6	5'
NGC 2168 Messier 35	Open Cluster	06h08m.9	+24°20'.4	5.1	28'
IC 443	Supernova Remnant	06h16m.9	+22°46'.5	12	40'
NGC 2266	Open Cluster	06h43m.2	+26°58'.2	9.5	6'
NGC 2331	Open Cluster	07h07m.2	+27°21'.7	8.5	18'
NGC 2365	Galaxy	07h22m.5	+22°04'.8	12.4	2.7'×1.5'
STREICHER 2 DSH J0723.2+2916	Asterism	07h23m.1	+29°16'.9	10	3.2'
NGC 2371 NGC 2372	Planetary Nebula	07h25m.6	+29°29'.4	11.3	55"
NGC 2395	Open Cluster	07h27m.2	+13°35'.2	8	12'
Sh 2-274	Emission Nebula	07h29m.2	+13°14'.7	13.5	615"
NGC 2392	Planetary Nebula	07h29m.2	+20°54'.7	9.9	48"
NGC 2420	Open Cluster	07h38m.5	+21°34'.4	8.3	10'



The constellation of Grus



Blue Crane *Anthropoides paradiseus*
 Photograph: Joe Grosel

GRUS

An Elegant Starry Bird

Slender and lithe forms are typically associated with wild birds. When we look up at the stars, we find interesting shapes and patterns. As it combines the world of the wild and the world of the night sky, it is not that difficult to find a constellation like Grus the Crane presenting itself to our imagination. In real life the Blue Crane is very special, and is the South African National bird.



Known to the Germans as "der Kranich", Grus was introduced by Johann Bayer in 1604. Bayer (1572–1625) was a German lawyer and amateur astronomer who assigned to bright stars of a constellation a letter of the Greek alphabet: alpha the brightest, beta the next brightest and so on. The French and Italians called the constellation "la Grue" and in England it had the popular names Flamingo and Stork.

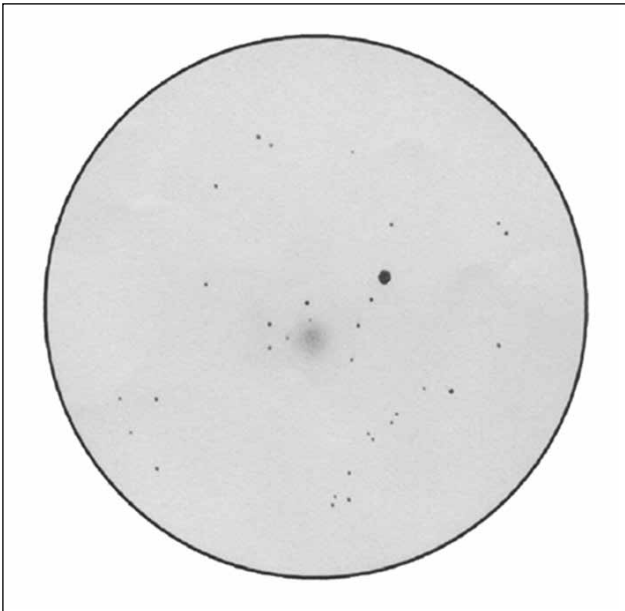
The eye of this beautiful starry bird is represented by the magnitude 3 gamma Gruis, a lovely white prominent star in the far north-west of the constellation. Follow the line of stars southwards to trace the outline of the starry bird. The beautiful naked-eye double-star delta Gruis, at magnitudes 3.9 and 4.1 respectively is situated more or less in the middle area of the starry line. However, a dark starry night sky is recommended for splitting them with the naked eye.

Perhaps the most famous object in Grus is the exceptional planetary nebula **IC 5148/5150**. The identity was noticed by Cuno Hoffmeister in 1959, based on plates taken with the 10-inch astrograph at Boyden Observatory, Bloemfontein. This beautiful object is situated only a degree west from magnitude 4.4 lambda Gruis, along the long and slender neckline of the bird. The ghostly round nebula appears smooth with a dark, hollow central region. The central star shows up well in photographs but, surprisingly, I could not see it, and I am not the first to have reported its elusiveness during observation.



IC 5148/5150 Photograph: Steve Crouch

Higher magnification and an (O-III) filter highlight the knotty dusty, uneven surface of IC 5148/5150 well. There is a definite brightening along the eastern and western edges, with the eastern edge perhaps a tad brighter. The nebula's colour ranges from pale white to light grey, with a magnitude 11 star situated just outside its southern edge. Brian Skiff noted that a (O-III) and (UHC) filters gave similar contrast enhancements, but that the (UHC) was better at showing the annularity, which was subtle. The object was mistakenly catalogued twice in the 20th century, as Dreyer has published the IC II catalogue in 1908. It had been independently discovered by Walter Gale from Australia and Lewis Swift from the USA.



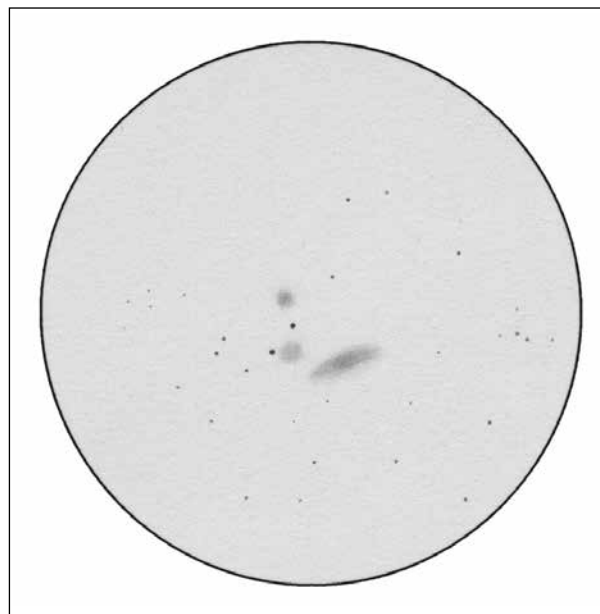
NGC 7213 - Galaxy

In the shadow of the next-door neighbouring double-star alpha Gruis, the elliptical galaxy **NGC 7213** is only 16' to the south. Rounder than round and relatively bright, it looks somewhat like a large star out of focus. The galaxy brightens up to an outstanding broad nucleus, the focal impression of the galaxy. No fewer than seven galaxies can be seen in a degree field of view. Hartung compares the object to a remote globular. The galaxy NGC 7213, which is also a member of the Grus Galaxy Cluster, was discovered by Sir John Herschel.

Half a degree further east the exceptional, unmistakable pencil-like galaxy **IC 5170** can be seen as an oblong shape in a north-south direction, and gradually brightens towards the central area.

A double star worth paying a visit is pi Gruis, situated 2.7 degrees north-east of alpha Gruis, displays a most outstanding crimson red and silvery white colour combination. The red carbon star pi1 fluctuates from magnitude 5.4 to magnitude 6.7 over a period of 150 days. Carbon build-up in the star's upper atmosphere dims and reddens its light.

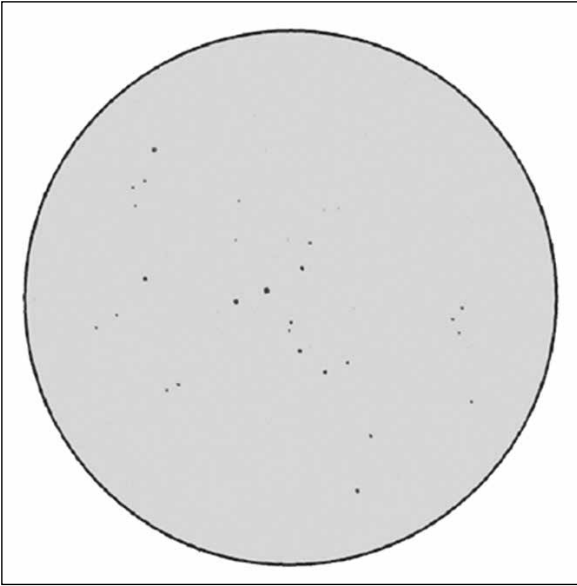
A bunch of galaxies is situated between pi and alpha Gruis. The focus around the trio of galaxies is a pair of magnitude 8.5 yellow-coloured stars situated virtually between them. The brightest galaxy **NGC 7232** appears as an elongated thin dust lane in an east-west direction, with a bright centre and a hazy outer envelope. The companion member **NGC 7233**, towards the east is nothing more than a soft, wispy glow. There is also a slightly brighter member **NGC 7232B** north of the pair of bright stars. Three more galaxies are situated a further 25' to the west.



NGC 7232B, NGC 7233, and NGC 7232
Galaxies

Situated along the Crane's eastern feathery wing 2.5 degrees east of rho Gruis, the galaxy **NGC 7424** portrays a beautiful open spiral with a very small, bright nucleus. Although it is difficult to detect the spiral arms, it is by no means impossible. With the use of averted vision, structure can be glimpsed on the hazy surface. Averted vision is a way of gazing off to one side of the field of view in order to use your eye's sensitive rods to detect fainter specks of light. Studies show that the supernova 2001ig situated in NGC 7424 shed valuable light on the nature of Wolf-Rayet stars.

Barely 1.5 degrees further north, the edge-on galaxy **NGC 7410** also known as Bennett 129a can be searched out. It displays a bright, large and elongated shape in a north-east to south-west direction. This galaxy is relatively easy to spot and gradually brightens towards a small nucleus. The south-western side appears fainter and thinner, with a magnitude 12.5 star near the northern tip. Although it displays a smooth surface, higher magnification brings out mottled areas. A double star graces the star field just south of the galaxy. Barely seen was the light speck of the companion galaxy **NGC 7404**, situated only 22' north of NGC 7410.



There are few experiences that are as pleasurable as coming across an incidental asterism in the course of observations. This is an asterism with a difference: the flipped capital letter J is easy to distinguish, with the top horizontal bar running from north-west to east. This little surprise is located 3 degrees north-west of NGC 7410. The brightest star in this grouping is the lovely yellow coloured magnitude 9-star HD 214875 at RA: 22h41m.7 – DEC: -38°05'.8.



NGC 7599, 7590, 7582 and 7552
phys.ttu.edu

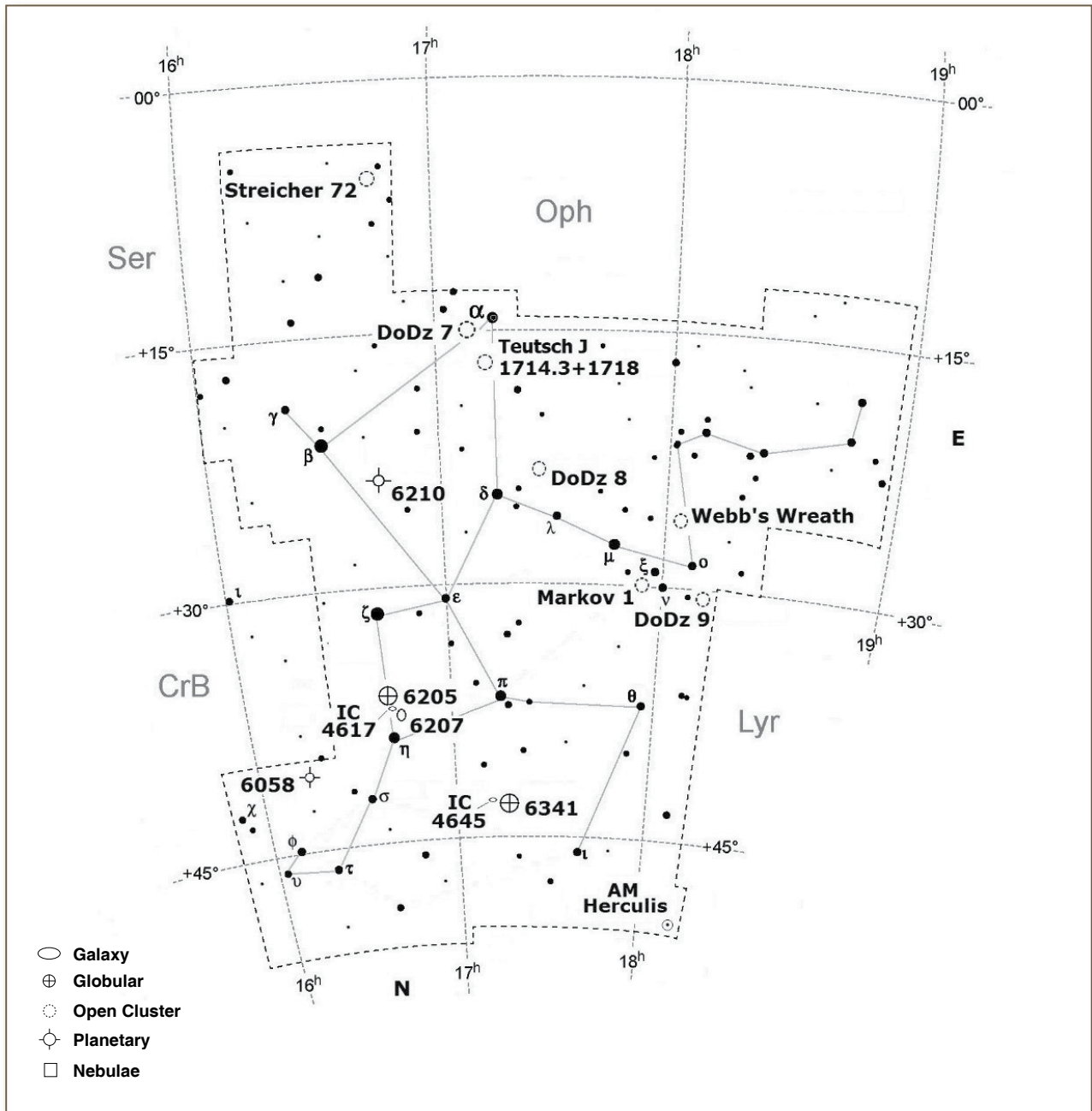
The far eastern part of the constellation houses a trio of galaxies 1.4 degrees south of magnitude 5.5 phi Grus. The eastern member **NGC 7599** displays a cigar shape in a north-east to south-west direction. Higher magnification reveals the north-eastern tip to be somewhat frayed at the edges and hazier than the more defined south-western tip. **NGC 7590**, about 5' to the west, is the smallest, although faint, it is relatively easy to spot in ideally dark skies with a medium size telescope. The surface brightness of this galaxy works up to a quite outstanding oval nucleus. The south-western member, **NGC 7582**,

the largest and brightest, displays a relatively bright oval in a north to south direction. High magnification reveals a small, point-like nucleus and very hazy edge, perhaps indicating spiral structure. All three galaxies were found by Dunlop in July 1826. The Grus Trio is quite well defined against the star field, covering an area of only 18'. The original name is Grus Quartet, (name coined by Shobbrook in 1966), which also includes **NGC 7552**, situated 28' further south-west of the group. It is an elliptical galaxy with a low surface brightness and slightly brighter towards the nucleus.

The galaxy **IC 1459**, is almost 80 million light-years away and situated on the boundary between the constellations Grus and Piscis Austrinus. It is also one of the brightest IC objects listed – even brighter than most of the NGC numbered objects in Grus. The galaxy displays a wisp of light surrounded by a halo of haziness. Slightly tilted in a north-east to south-west direction, the glow surprisingly displays a bright stellar nucleus. With even higher magnification and averted vision it is just possible to distinguish the galaxy IC 5264 pairing to the south-west. What makes IC 1459 so special is the fact that it is situated virtually in the centre of a string of a dozen galaxies spanning 2 degrees at approximately equal distances from one another. The string of galaxies runs in a curved line into the constellation Piscis Austrinus, with the most northern IC 5270 and IC 5273 to the south.

The plains of the Karoo are the home of the southern Crane, but what captures and holds my attention is this bird's graceful flight. To study a constellation associated with such a splendid bird is an enormous privilege and a pure pleasure. Grus is arguably one of the most beautiful constellations that the southern hemisphere has laid at our proverbial front door.

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 5148 IC 5150	Planetary Nebula	21h59m.5	-39°23'.1	11	120"
NGC 7213	Galaxy	22h09m.3	-47°10'.0	10	4.8'×4.2'
IC 5170	Galaxy	22h12m.5	-47°13'.3	13	1.8'×0.8'
NGC 7232	Galaxy	22h15m.6	-45°51'.0	11.6	3'×1.1'
NGC 7232B	Galaxy	22h15m.7	-45°46'.8	12.9	1.7'×1.5'
NGC 7233	Galaxy	22h15m.8	-45°51'.1	12	1.8'×1.4'
NGC 7404	Galaxy	22h54m.3	-39°19'.0	12.6	1.7'×0.9'
NGC 7410	Galaxy	22h55m.0	-39°39'.7	10.5	5.8'×1.7'
IC 1459	Galaxy	22h57m.2	-36°28'.0	10	4.9'×3.6'
NGC 7424	Galaxy	22h57m.3	-41°04'.0	10.2	7.6'×6.2'
NGC 7552	Galaxy	23h16m.2	-42°35'.2	10.4	3.8'×2.26'
NGC 7582	Galaxy	23h18m.4	-42°22'.0	10.1	6.9'×2.6'
NGC 7590	Galaxy	23h18m.9	-42°14'.1	11.3	2.9'×1.2'
NGC 7599	Galaxy	23h19m.3	-42°15'.0	11.1	4.7'×1.5'

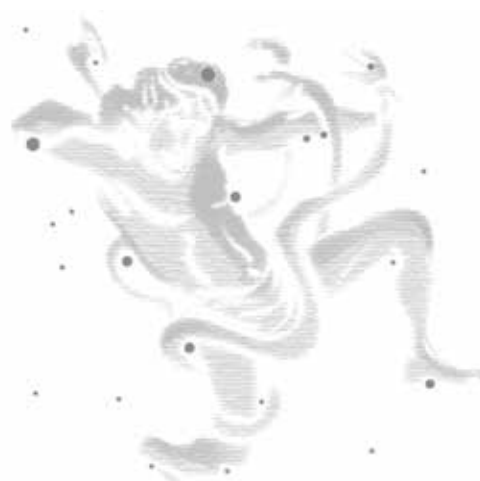


The constellation of Hercules

HERCULES

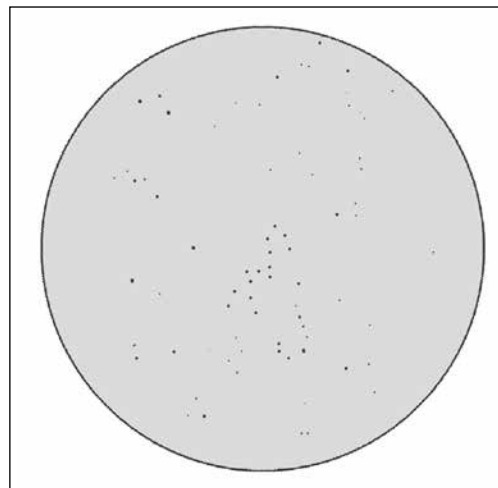
The Sky's Strong Man

Hercules was one of the oldest constellations to be named and portrays the mythology of the past in a very special way. The "strong man" was seen as a hero crouching on one knee, bow and arrow in hand. The constellation Sagitta was probably seen as the arrow shot off by him. Before the common era the constellation was simply called The Kneeler, but the real name ascribed to the strong man in antiquity was Ninurta, the War God. The constellation is the fifth largest of the 88 constellations inhabiting the starry skies.

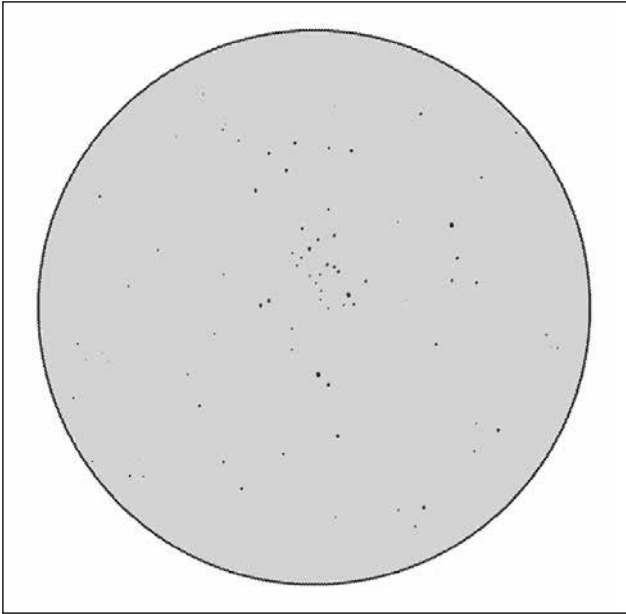


This hero lifted his head looking south-east with the star alpha Herculis in the direction of the constellation Ophiuchus. This red giant star is 400 light-years away and also a variable ranging between magnitude 2.7 and 4 during a six-year period. The constellation offers a good variety of objects. The first one to discuss is **DOLIDZE-DZIMSELEJSVILI 7** (DoDz 7), which is situated only 1.5 degrees north of alpha Herculis. The beauty of open clusters, and especially the ones with fewer stars, always tells a story of one kind or another. DoDz 7 shows itself off as a little boat drifting on a black sea, with the starry night sky to accompany it. The brighter stars situated in an east to west direction can be seen as the base of the sailboat with a nice yellow coloured star south to mark the mask. Faint stars fill in the gaps and outline the impression. The Finnish observer Jere Kahanpää was the first to mention the resemblance and since then the grouping has been known for it.

I sniffed out **STREICHER 72** by using a star program, followed by a search through the 16-inch telescope. The very faint grouping is in the southern corner of the constellation in a fairly densely packed star field. The impression, however, is amazing in that in a handful of similar magnitude stars one can see perhaps the image of a starry chair. The galaxies NGC 6224 and NGC 6225 are situated only 20' towards the south-east.



STREICHER 72 – Asterism



TEUTSCH J1714.3+1718 - Asterism

About 2 degrees north of alpha Herculis Philipp Teutsch discovered the asterism **TEUTSCH J1714.3+1718**. The dainty tight grouping of five stars can be easily outlifted between the field stars.

The backbone of this constellation is surely beta Herculis, a binary star with a spectrum similar to that of our Sun and 147 light-years away from us. One of the sky's most perfect planetary nebulae, **NGC 6210**, can be found 4 degrees north-east of beta Herculis and situated 10' north-west from a magnitude 7 light orange

coloured star. It displays a near perfect round glow with a hazy edge and if I'm not mistaken, with a hint of green and light blue colour flowing into each other. The magnitude 12 central star is covered in its misty blanket. The well-known Stephen O'Meara found "some crisp edges to an inner bubble and the core appeared as an amorphous knot in a speckled mist with high magnification". Also known as the Turtle Nebula, it can most definitely be described as one of the most delicate nebulae.

The open cluster **DOLIDZE-DZIMSELEJSVILI 8** (DoDz 8), is situated 1.5 degrees east from its host star, delta Herculis towards the middle area of the constellation. Two pairs of double stars, north and south, framed this grouping, which displays a sort of zigzag shape in formation.

The strong man's arm stretching from the star delta Herculis towards the east where a few star groupings possess a lot of character. The grouping **MARKOV 1** displays an altogether lovely half-moon shape open towards the west with a few yellow and orange coloured magnitude 10 stars. Canadian amateur Paul Markov documented this grouping in 2000, that reminded him of a teapot shape.

The grouping **WEBB'S WREATH**, which has been catalogued in the Thomas William Webb observing guide *Celestial Objects for Common Telescopes*, is situated 2.6 degrees south from omicron Herculis. If an observer is looking for a colourful half-moon shape grouping, then this is it, although rather faint. A lovely yellow magnitude 7-star HD 164922, tops the grouping towards the south.

A colourful splash of stars quite outstanding against a faint star field is **DOLIDZE-DZIMSELEJSVILI 9** (DoDZ 9), situated 2.5 degrees north-east of nu Hercules in a field sprinkled with faint stars. Madona Dolidze was a Georgian astronomer who worked from the late 1950s until 1975 using objective-prism plates with the Abastumani 70-cm Maksutov telescope, surveying for emission-line stars, red stars, and other objects. The star groups were reported incidentally from these surveys and are regions where there seemed to be either groups of stars with early spectral types or where there be a main-sequence-like run from brighter early-type stars toward fainter redder stars. The entire latter sort of groupings is non-physical, simply from the fact that the range in magnitudes observed is less steep than what a real cluster would show. Dolidze worked with G. Dzimselejsvili in 1966 and publish a list of 11 open clusters which has been catalogued with both of their names.

The Hercules constellation is easily recognisable with the four corners marked by epsilon and zeta towards the south, with eta and pi Hercules north. Within this square is the most famous globular cluster in the northern hemisphere, none other than **NGC 6205**, also known as Messier 13, situated more or less halfway between eta and zeta Hercules. M13 was discovered in 1714 by Edmond Halley, who noticed it with the naked eye as he hunted for comets at the time. It is large and bright because it is relatively close to us and has been called the Great Hercules Cluster. Also, in Hercules is a cluster of galaxies called the Hercules Galaxy Cluster, but it is a difficult task to unravel.

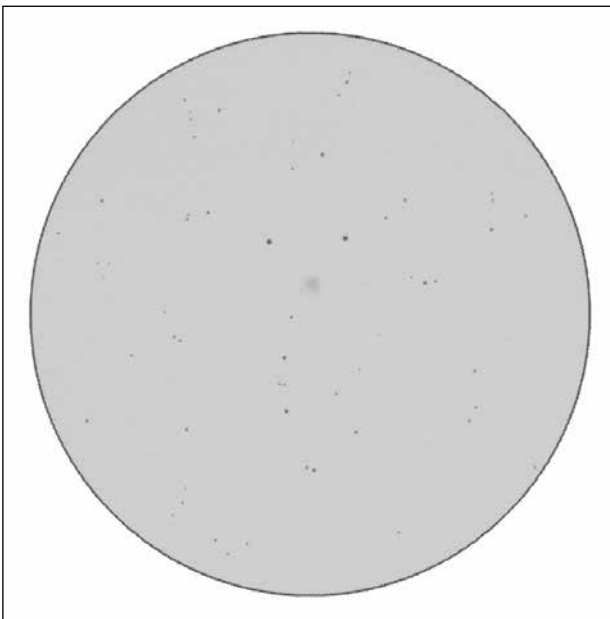
M13 is a stunning globular cluster and truly unique. Stars seem to blow out with star outliers randomly into the star field from the cluster fringy edge and more so on the north-western side. The bright wide core covered in a mist of faint stars is extremely compressed. A few dark lanes can be seen through the mass of stars. The most prominent dark wedge is cutting towards the south-eastern part of the globular cluster and is called the Propeller by amateurs. An extremely faint and small galaxy, IC 4617, is situated less than 10' north, riding in the misty rain of M13.



NGC 6205 – M13 – Photograph: Fitz

However, the galaxy **NGC 6207** is situated less than half a degree further north. It displays a soft north-east to south-west oval which is somewhat brighter towards the middle. With higher magnification the nucleus grows in brightness. NGC 6207 was discovered in 1787 by William Herschel with an 18.7-inch f/13 speculum telescope. He called it "pB, pS, E sp-nf, vgmbM, which means pretty bright, pretty small, elongated in the direction south proceeding to north following, the light becoming very gradually much brighter towards the middle".

Half the size of M13 and most of the time overlooked by the Great Hercules Cluster is the globular cluster **NGC 6341**, better known as Messier 92. It is situated halfway between the star's eta and iota Herculis. M92 is beautiful, initially lightening slowly then suddenly growing brighter to a compressed unresolved core. A few dark spots settle among the stars with a more notable string of faint stars flowing north-east. It is a very old globular cluster, about 25 000 light-years distant. J.E. Bode discovered M92 in 1777 and it was added as number 92 in the 1781 Messier's catalogue. There is also a faint galaxy IC 4645 half a degree west, to keep up the norm of competing with the famous M13. On top of that, M92 is accompanied by a chain of galaxies trailing behind, stretching for almost 3 degrees south.



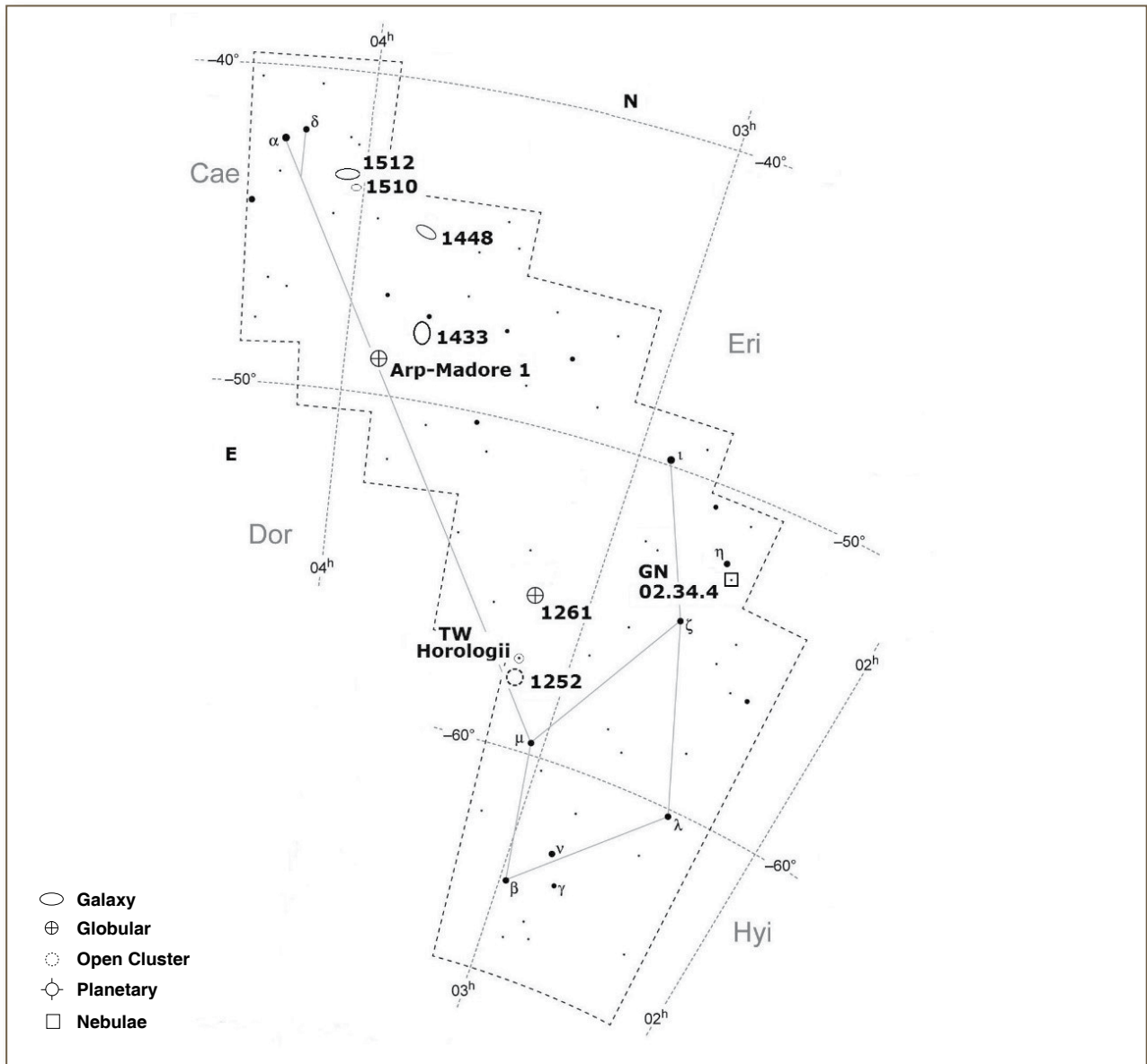
NGC 6058 – Planetary Nebula

In the north-western corner of the constellation close to the border with the constellation Corona Borealis a lone planetary nebula can be found. The small and faint disc of **NGC 6058** displays a hazy outer envelope and washed-out greyish colour. The central star shines dimly at magnitude 13.8, making it difficult to spot. William Herschel discovered NGC 6058 in 1787 and described it as a star with nebulosity. However, it is special because it is situated in a very strange position in relation to the surrounding stars. The planetary nebula forms a very distinct Y shape with the surrounding stars.

Tucked into the most north-eastern corner, a degree east from the merging pair of galaxies, both known as NGC 6582, is the variable star AM Herculis. The star with a spectral Type-M4.5 ranges between magnitude 12.3 and 14, was discovered by Maximilian Franz Joseph Cornelius Wolf in 1923, and is lying just outside the so-called rectangular Uhuru source. The Uhuru satellite positively confirmed AM Herculis as the optical counterpart of 3U 1809+50, a weak X-ray source. The X-ray telescope aboard the SAS-3 satellite was striving a better position for 3U 1809+50, and the accuracy of the measurements, the position of the X-ray source was the same. At the time the thought might have been that it was a quasar or related object. This unusual star has a very strong magnetic field surrounding the system. It has now been called AM Her-type, which are cataclysmic variable stars with extremely strong magnetic fields also known as Polars.

You do not need to be strong to enjoy the various wonderful objects that the starry strong man has to offer – just do not try to take him on in a fight!

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6058	Planetary Nebula	16h04m.4	+40°41'.7	12.9	23"
NGC 6205 Messier 13	Globular Cluster	16h41m.7	+36°28'.2	5.7	16.6'
IC 4617	Galaxy	16h42m.8	+36°41'.0	15	0.5'×0.1'
NGC 6207	Galaxy	16h43m.1	+36°50'.0	11.6	3'×1.1'
NGC 6210	Planetary Nebula	16h44m.5	+23°48'.5	8.8	14"
STREICHER 72 GSC Group 396-389	Asterism	16h47m.3	+06°27'.2	12	8'
Dolidze Dzimselejsvili 7	Open Cluster	17h11m.4	+15°28'.6	6	6'
TEUTSCH J 1714.3+1718	Asterism	17h14m.3	+17°18'.1	13	2.2'
IC 4645	Galaxy	17h14m.7	+43°06'.2	15.3	0.4'×0.4'
NGC 6341 Messier 92	Globular Cluster	17h17m.1	+43°08'.2	6.4	11.2'
Dolidze- Dzimselejsvili 8	Open Cluster	17h26m.4	+24°11'.6	6.2	14'
MARKOV 1	Open Cluster	17h57m.2	+29°29'.2	6.8	15'
WEBB'S WREATH	Open Cluster	18h02m.3	+26°18'.0	10	5.5'
Dolidze- Dzimselejsvili 9	Open Cluster	18h08m.8	+31°32'.2	10.5	28'



The constellation of Horologium



This old family clock is close to 100 years old

HOROLOGIUM

The Pendulum Clock

"Time and tide wait for no man" – a proverb of which the truth is in no doubt. Everything revolves around time, which is why it isn't at all strange to find a starry clock in the sky! Horologium is such a constellation.

Going back somewhat in time, Frikkie de Bruyn has drawn our attention to the following: By the end of the 19th century scientists believed in a universal quantity called time which all clocks would measure. However, Einstein's theory of relativity has overthrown two pillars of the 19th century science: absolute rest, as represented by the idea of an all-pervading ether and absolute or universal time. Every person has his or her own personal time. If two people were at rest with respect to each other their times would be the same, but not if they were moving. This has been proved in a number of experiments, including one involving two atomic clocks which were flown in opposite directions around the world and showed slightly different times on their return.

Let us spend some time in the constellation Horologium which lies between Eridanus to the north, Dorado, diagonally eastward, and Hydrus to the south. The constellation was originally named Horologium Oscillitorium to honour Christiaan Huygens, the famous Dutch scientist, inventor of the pendulum clock in 1657, and the discoverer of Saturn's rings. Horologium is one of Nicolas Louis de Lacaille's fourteen constellations which he named during his stay at the Cape of Good Hope. It was with this visit that he established the framework for astronomy in South Africa. In my mind's eye I clearly see the gentleman de Lacaille also carrying his pocket watch with some pride, elegantly attached to his jacket by means of a gold chain. Time possibly stood still for him too, so that he was able to explore the beautiful southern night sky in sheer amazement. Tom Polakis captures the truth by commenting: "Within the Clock constellation you'll go back in time to find some of the southern hemisphere's most distant galactic gems."



The constellation stretches from alpha Horologii in the north-east to beta Horologii in the south, a distance of more than 20 degrees. The bend in the pendulum clock section, turns about iota, eta and zeta Horologii. One could say the pendulum is hanging elegantly along a line from mu to alpha Horologii, housing a wealth of deep sky objects to be studied on its arc. The first "i" in Horologium comes from the constellation name itself. In Latin in most cases, the genitive form of nouns whose nominative form ends with -um or -us is made simply by replacing the um or us to i. If the last letter preceding the -us or -um happens to be another i the then resulting genitive form ends up ending in double ii.

Our starting point in time is the super-white magnitude 4.9 beta Horologii which is situated only 25 degrees north of the southern celestial pole. The star mu Horologii, points the way another 2 degrees north-east to the open cluster **NGC 1252**. This grouping is arranged in a V-formation, pointing north. The area in between is filled with fainter members. A lovely, yellowish magnitude 6.2 star, HD 20037, dominates this grouping and is situated towards the middle area of the western leg of the cluster, so to speak. It is not certain if this group is a true open cluster, although spectroscopy has suggested that around a dozen of the members are at the same distance, about 2000 light-years away, but they are not related.

Don't miss the beautiful red carbon star TW Horologii, normally magnitude 5.7, which displays slight variations of magnitude 0.6. It is one of the sky's brightest carbon stars. This Type-N semi regular variable star, located a few arc-minutes north-east of NGC 1252, is most probably a member of the cluster.



NGC 1261 – Photograph: NRGBhi

Still on the move, like the typical hand of a clock, and yet another 2.3 degrees to the north, we encounter the globular cluster **NGC 1261** also known as Bennett 11. One's first impression is that of a very nice, bright object, well condensed, quite round in shape with no sharp edges. With higher magnification, the frosted glow becomes granular in texture, with a random sprinkle of faint stars. The core appears slightly elongated in a north-south direction with a knot of stars on the cluster's

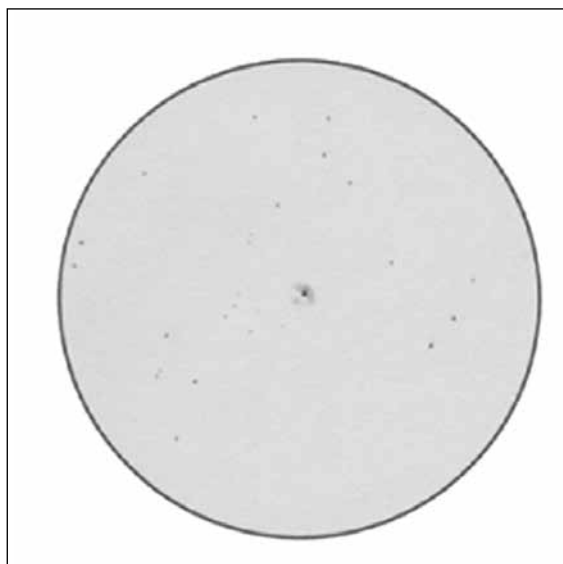
northern edge. A prominent magnitude 9 yellow star is situated about 4' to the north-east. Jenni Kay described it as "a stunning peppery glow with a brief flickering of countless stars". The galaxy pair ESO 155-10 is situated 4.5' to the south-west, but is far too faint to even glimpse through ordinary telescopes.

The magnitude 5.2 eta Horologii marks the bend of the indicated time zone, which is 33' north of the small emission nebula **GN 02.34.4**. This nebula is about 250" in diameter, and surrounds the magnitude 8.3-star HD 16405, which illuminates it.

One of the most distant globular clusters, **ARP-MADORE 1**, is situated in the eastern part of the constellation, half a degree east of the galaxy IC 2004. Astronomers discovered this object on plates taken with the Cerro Tololo 4-metre telescope in 1979, confirming the nature of this object as a globular cluster. It is a truly distant object associated with our Milky Way, with speculation that it could be as much

as 400 000 light-years away. It is believed to display only a small circular haze, less than 1' across, understandably with no stars resolved.

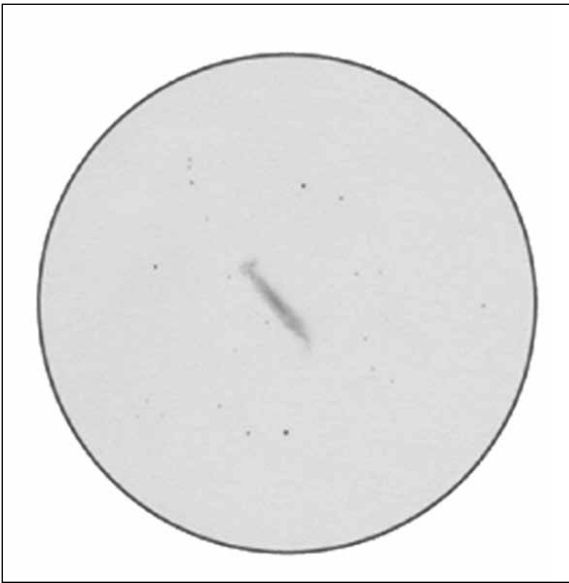
NGC 1433 rides the centre of the pendulum between alpha and iota Horologii, a distance of nearly 17 degrees. The galaxy appears as a fairly large, circular to oval smear of light. From a relatively bright bar-like nucleus it shades out to form a woolly outer edge. Careful observation reveals detail around the core and outer halo. Known as a barred spiral or prototype ring galaxy, it has faint arms connected to the east and west ends, understandably visible only with much larger telescopes. The small oval galaxy IC 1984 is positioned 24' west of NGC 1433.



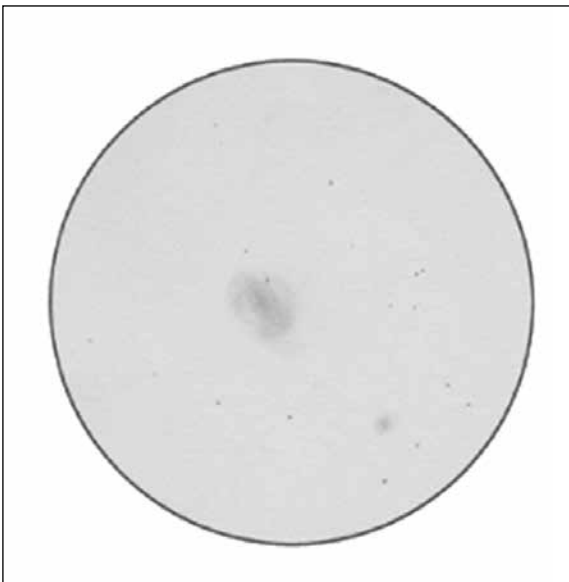
GN 02.34.4 – Nebula



NGC 1433 – Photograph: Flickr



NGC 1448 – Galaxy



NGC 1512 and NGC 1510 – Galaxies

Tick-tuck another 2.5 degrees further north to a fine example of an edge-on galaxy. **NGC 1448**, also listed as NGC 1457, displays a beautiful thin ray of light in a north-eastern to south-western direction. The north-eastern tip of the light-ray is slightly hazier and curving towards the north. Although the core is extended it does not sport a prominent nucleus.

The elegant pendulum bob is represented by the magnitude 3.8 alpha Horologii in the far north-east of the constellation, with magnitude 4.9 delta Horologii its close neighbour. These two stars are only 40' apart, and beautifully convey the impression of a little bob. The galaxy **NGC 1512** forms a long triangle of 2 degrees south-west of the two above-mentioned stars. The galaxy has a soft circular glow, revealing a fractionally distinct bar across the middle. The inner nucleus brightens up to a stellar appearance. James Dunlop described it as a small faint round nebula, a little brighter in the centre. John Herschel also noted that it is slightly elongated but curiously, in a second observation he called the object a "globular cluster resolved into

stars barely perceptible". Recent Hubble photographs show a wide circum-nuclear starburst ring of infant star clusters. The very faint companion galaxy **NGC 1510** is situated on the south-western edge and is just a glimmer of light, barely visible.

If we think of well-known clocks around the world, the first one that comes to mind is of course London's Big Ben. Located at the Houses of Parliament, Big Ben features in songs, movies and many photographs. Times Square's Clock needs no introduction, but the fairly ordinary Cuckoo Clock is one I remember from my childhood days.

The world's largest clock is the Pyramid Clock in the temple City of Chechen Itza, Mexico. However, a clock which has an incredible record for accuracy is Rome's Tower Clock, also on the World's National Register of Historic Places. More than 946 000 hours of history have been marked by the sound of this clock. The historical Strasbourg Cathedral Clock, which dates back to 1843, stands an incredible 18 metres tall. For our star-lovers the Orloj Astronomical Clock in Prague is worth remembering – it is a mechanical clock and astronomical dial, dating back to 1410.

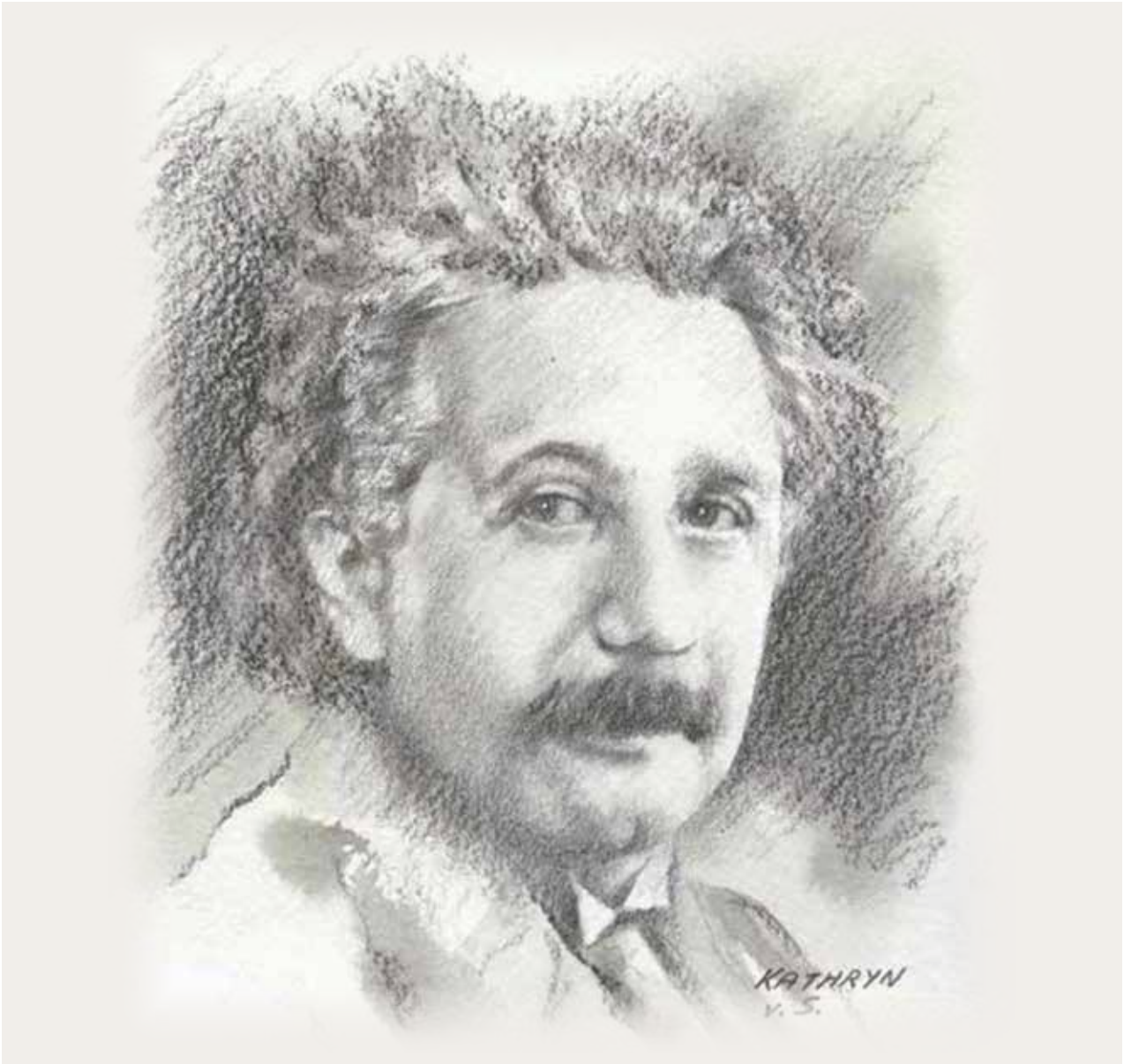
Then there is the Jens Olsen's World Clock in Copenhagen – it tells the time, shows the night sky, Moon phases and Solar eclipses, and consists of 12 movements, which together have over 14 000 parts. One of the most intriguing clocks was built by George Jessop near Ely, Nevada, and is now in the Horton Mall in downtown San Diego. On the day its creator died, the clock stopped and no-one was able to get it going again, or so they say.



Bath Abbey with its prominent clock dates from 1499.

According to Andrew White, after it was built it housed a community of Benedictine monks, this is why it is referred to as an abbey and not a cathedral.

Time waits for no-one, so please create some time to watch the starry skies above you at night.



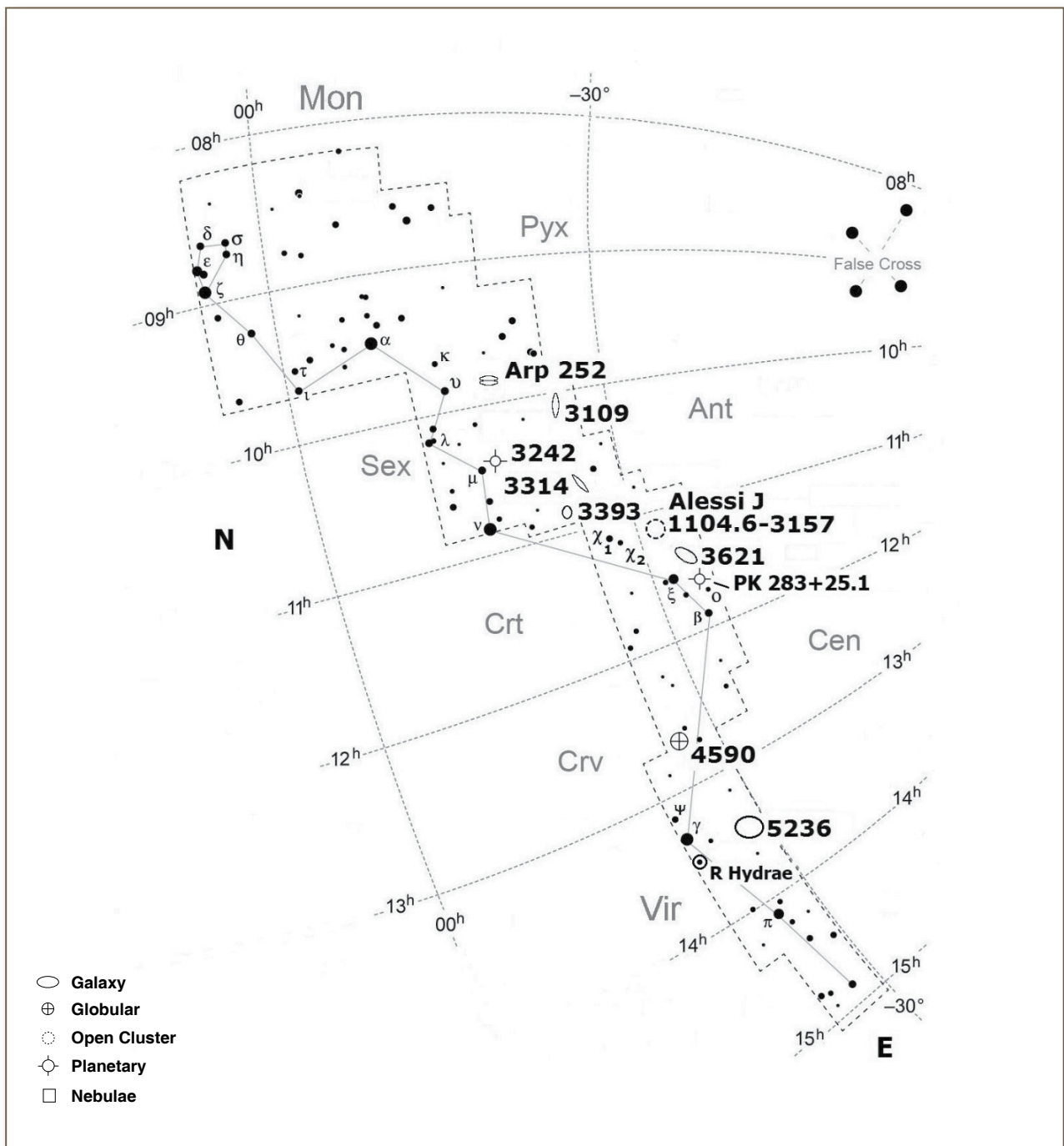
Albert Einstein – Pencil Sketch: Kathryn van Schalkwyk

Albert Einstein was born on Friday 14 March 1879 in Ulm, Southern Germany. He was the only son; a quiet and rather solitary child preferring to read and listen to music. Einstein's Special Relativity Theory include his famous equation $E = mc^2$ ($E =$ energy, $m =$ mass and $c =$ the speed of light), which goes on to predict that nothing real can travel faster than the speed of light and the faster anything travels the slower time will seem to pass. Einstein received the Nobel Prize for Physics in 1921. He was also awarded the second Planck medal to be issued by the Royal Prussian Academy in 1929. Even when he was lying gravely ill, he asked for the latest pages of his mathematical calculations. Einstein died on 18 April 1955.



With Albert Einstein in the Madame Tussauds
Wax Museum

OBJECT	TYPE	RA	DEC	MAG	SIZE
GN 02.34.4	Emission Nebula	02h36m.1	-53°02'.8	8.3	250"
NGC 1252	Open Cluster	03h11m.4	-57°38'.5	8.4	20'
NGC 1261	Globular Cluster	03h12m.3	-55°13'.1	8.3	6.8'
TW Horologii	Carbon Star	03h12m.6	-57°19'.0	5.7	*
NGC 1433	Galaxy	03h42m.0	-47°13'.0	9.9	6.5'×5.9'
NGC 1448 NGC 1457	Galaxy	03h44m.5	-44°39'.2	10.7	7.6'×1.7'
ARP-MADORE 1	Globular Cluster	03h55m.0	-49°36'.0	15	1'
NGC 1510	Galaxy	04h03m.5	-43°24'.1	12.7	0.9'×0.9'
NGC 1512	Galaxy	04h03m.9	-43°21'.0	10.3	8.9'×5.6'



The constellation of Hydra

HYDRA

The Female Multi-Headed Serpent

Hydra the female Water Snake, is the longest of today's 88 known constellations, stretching from Libra up to the northern constellation Cancer – more than 3% of the entire night sky. It is quite a challenge to deal with this expansive constellation in one article, especially as it contains exceptionally magnificent objects that make a visit to the constellation decidedly worthwhile.



Of course, what makes the constellation all the more interesting is the fact that it raises the question, “why the name – why a female snake?” According to legend, Hydra was the multi-headed snake which had the ability to grow two new heads for every one that was cut off. The constellation was associated with the goddess Tiamat the ruler of the seawater who according to legend, kill her offspring. However slightly softer on the tongue is the German name *Wasserschlange*.

The northern part of the constellation is characterised by the magnitude 3 to 4 stars eta, sigma, delta, epsilon and zeta Hydrae, which could be seen as making up the head shape with a sharp-pointed nose.

The star alpha Hydrae, also known as Alphard, could easily be seen as a white diamond hanging on her slender neck (remember she is a woman). Sometimes also referred to as the Water Snake's heart line, it is located 180 light-years away from us. The Arabic name for this star is, The Solitary One, referring to the lack of bright stars in its vicinity.

A very special galaxy pair is **ARP 252** (PGC 27928 and PGC 27929), which is situated a few degrees west of NGC 3242 and has also been popularly known as the Question Mark Galaxy. It can be seen as a pair of interacting spirals, which the Hubble deep picture reveals in a unique way.



ARP 252 – Photograph: Terry Evans



NGC 3242 – Photograph: Dale Liebenberg

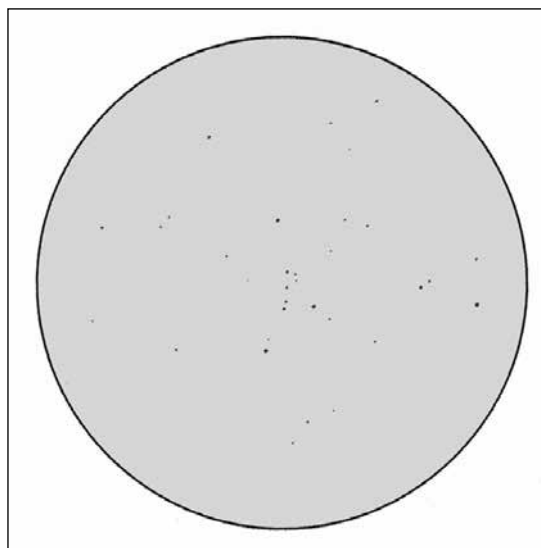
In the middle area of the constellation it is quite easy to locate the very orange-red magnitude 3.8 μ Hydrae and then to star-hop a degree south to the planetary nebula **NGC 3242**, also known as the Ghost of Jupiter. The outstanding, slightly oval nebula displays a soft outer envelope, a noticeable washed-out blue colour and a glimpse of the magnitude 12 star towards the centre. Through a somewhat larger amateur telescope it appears mottled and resembles a human eye, in contrast with the inner dark section around the star.

A faint darkish spot can be seen in the southern rim section. The northern side of the nebula seems slightly brighter than the southern side. William Herschel described this nebula as just a faint puffball during observations in 1785. Jenni Kay from Australia noted a soft, diffuse edge wrapped in multiple soft, layered shells with a strong response to the O-III filter.

The small spiral galaxy **NGC 3109** is situated 8 degrees further south. Astronomers pointed the Karoo Array Telescope (KAT), towards NGC 3109, which allowed them to see the HI radio emission and moving of the galaxy. When the gas is moving towards us the frequency of the spectral line is Doppler shifted upwards, and whereas the gas is moving away it is shifted downwards. A few degrees south-east, the tight knot of about a dozen galaxies also known as the Hydra I Galaxy Cluster shares a field of nearly 2 degrees. In the midst of the galaxy cluster the magnitude 4.8 lovely red colour star HD 92036 serve as a good indication to locate this group. However, the southern member in this group, **NGC 3314**, has a nice twist to it. The galaxy is also indicated both as NGC 3314A and NGC 3314B. Hubble pictures show two galaxies appearing to be head on, while they are actually tens of millions of light-years apart and it is only from our perspective that they appear to line up. Further north-east, on the border with the constellation Crater, the spiral galaxy **NGC 3393** contains a pair of super-massive black holes.

There is a lot more to discover and explore, so next time when you try to only glimpse these above-mentioned galaxies, remember the interesting facts woven around them. Sadly, only the most beautiful Hubble pictures show them in anything like their full glory.

The bright double star chi Hydrae, points the way further south to the asterism **ALESSI J1104.6-3157**. The group consists of a few 12 to 13 magnitude stars in a north to south direction, with a few more topping the scale to the west. Not at all an easy task to find this compact, faint and small asterism, but when found, it is nicely lifted out against the star field. However, the book (*Star Clusters - Archinal and Hynes*) indicate a larger C-shaped group which may be part of the asterism.



ALESSI J1104.6-3157 - Asterism

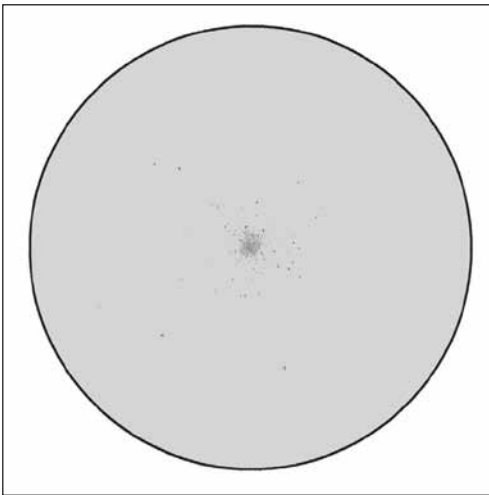
About 3 degrees further south-east is the galaxy **NGC 3621**, which in combination with field stars displays a special character. The spiral galaxy, lying in an elongated north to south direction, looks somewhat mottled, gradually getting brighter towards a wide, dense nucleus. The periphery is shrouded in mistiness, with faint splinter stars embedded on its northern surface. It has become a habit of mine to name an object according to the very first thought that strikes me when I look at it. My notes indicate "The Crux Galaxy" for this one guarded by a trapezium of stars closely surrounding the galaxy with a memorable impression of the Crux constellation.



NGC 3621 – Photograph:
Dale Liebenberg

The planetary nebula **PK 283+25.1**, is situated about 5 degrees west of alpha Hydrae, also known as the Southern Owl Nebula in Hydra. It relates to its northern cousin, the Owl Nebula, Messier 97, in the constellation Ursa Major due to its similar appearance. Photograph: Dale Liebenberg





NGC 4590 – M68
Globular Cluster

The bright globular cluster **NGC 4590**, also known as Messier 68, can be found about halfway between beta and gamma Hydrae. The globular cluster appears somewhat oval in a north-west to south-east direction with an obscure compressed core with a mist of faint stars indicating a star-rich cluster. It is apparently elongated in shape and might be attributed to the fact that there are faint clumps of stars visible on the northern edge. The eastern side of the globular is slightly more edged, whereas the south-western part filters out with faint star trails. It is however not at all easy to resolve the cluster, higher

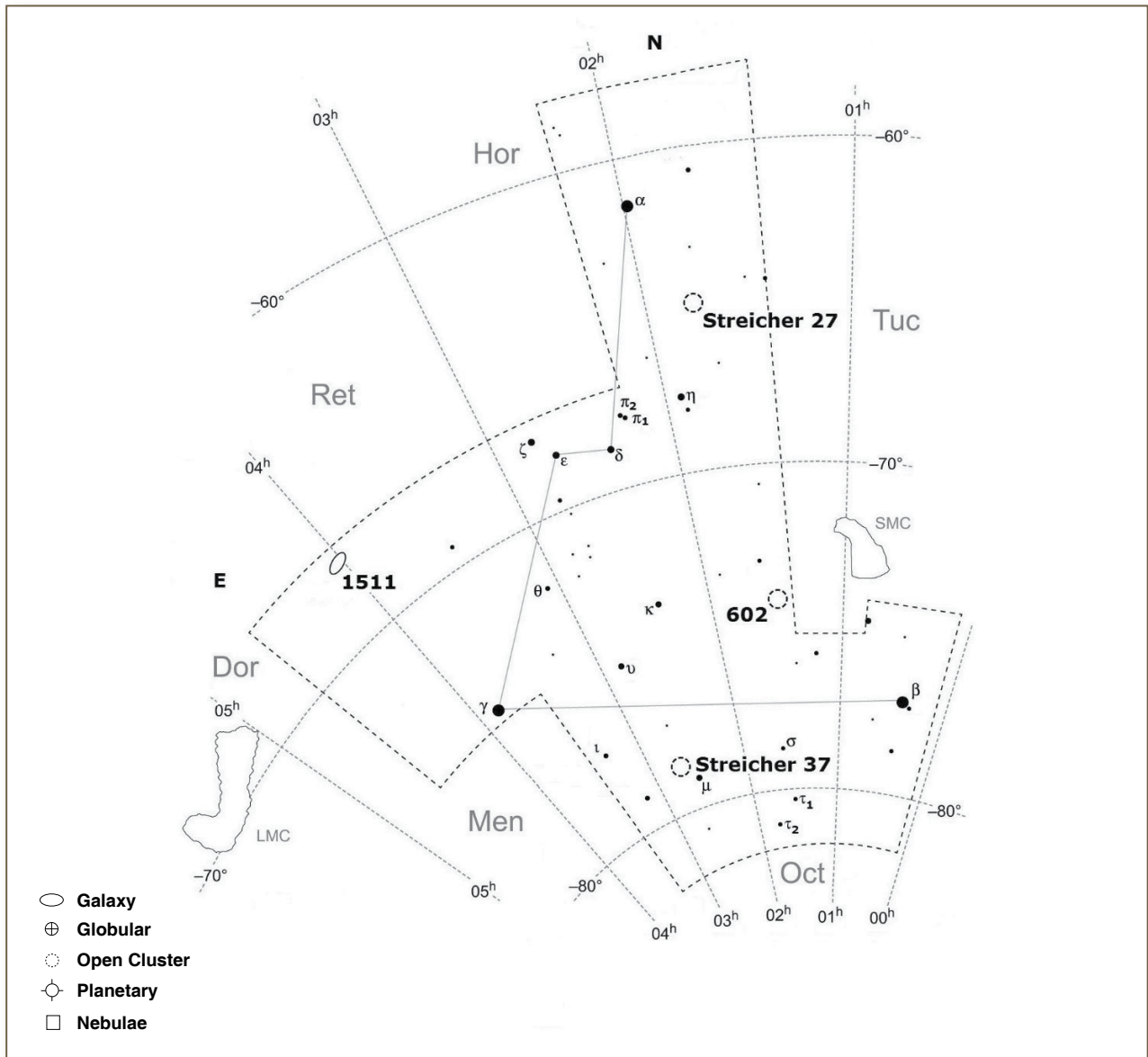
magnification and careful observation is needed.

The magnitude 2.9 gamma Hydrae shines with a lemon-yellow colour and could be seen as indicating the last curve towards the tail-end of the constellation. Hop from gamma Hydrae 2.5 degrees south-east to the variable star R Hydrae, one of the brightest long-period variables in the sky. It is an M-class Mira type star that reaches a maximum of magnitude 3 to 11 near its minimum. The reddish-orange colour star with a period of 389.6 days is classed with a spectral Type-M6-9, and a parallax of 8.05 milli arc-second.

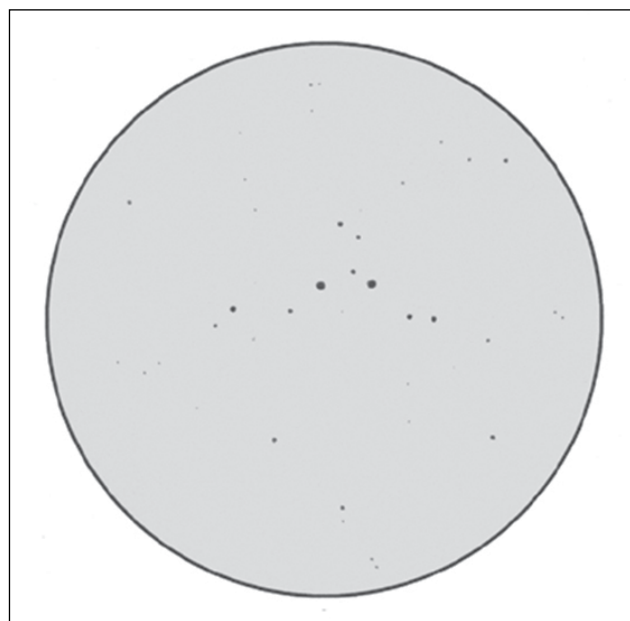
But the real show stopper in the Hydra constellation is the magnificent galaxy **NGC 5236**, better known as Messier 83, discovered by Nicolas-Louis de Lacaille at the Cape of Good Hope in 1752. The galaxy is situated barely 30' from the northern border with the constellation Centaurus and is also part of the Centaurus Galaxy Cluster. It is a large, bright, face-on galaxy with a soft, flimsy edge quite outstanding against the star field. The bright nucleus is obvious, and with careful observation it displays a soft halo around a more bar-like core. Really high magnification through larger amateur telescopes will bring out the delicate arm extensions which can be glimpsed curving out from the east end of the nucleus going south and the other arm from the western end going north. Faint stars peek through the glow, with a few brighter ones sighted just off the extreme eastern edge of the galaxy. More than a handful of supernova explosions have been found in this galaxy since 1923. Hydra is rich in galaxies, and a few interesting facts are attached to several of them, even though through amateur telescopes they would probably appear to be mere patches of light.

Never underestimate a woman, even if she is a constellation against the starry skies – she will show you a thing or two that is unbeatable.

OBJECT	TYPE	RA	DEC	MAG	SIZE
ARP 252	Galaxy	09h44m.8	-19°43'5	15	1.5'×0.4'
PGC 27928/9	Galaxy	09h44m.9	-19°42'7	15.3	0.9'×0.4'
NGC 3109	Galaxy	10h03m.1	-26°09'5	9.8	15'×2.9'
NGC 3242	Planetary Nebula	10h24m.8	-18°38'0	8.6	16"
NGC 3314	Galaxy	10h37m.2	-27°41'2	12.8	1.5'×0.8'
NGC 3393	Galaxy	10h48m.3	-25°10'8	12.2	2.1'×1.9'
ALESSI J1104.6-3157	Asterism	11h04m.6	-31°57'5	8	3.3'
NGC 3621	Galaxy	11h18m.3	-32°49'3	8.9	9.8'×4.6'
PK 283+25.1	Planetary Nebula	11h26m.7	-34°22'2	11.8	120"
NGC 4590	Globular Cluster	12h39m.7	-26°45'0	7.7	12'
R Hydrae	Variable star	13h29m.7	-23°17'0	3-11	389.6 days
NGC 5236 Messier 83	Galaxy	13h37m.6	-29°52'7	7.6	15.5'×13.2'



The constellation of Hydrus



Streicher 37 – Asterism

HYDRUS

The Small Snake

The constellation Hydrus first published by Bayer, must not be confounded with the ancient constellation Hydra. Explore this constellation with care known by the Germans as der Kleine Wasserschlange.

In the northern part of Hydrus, the asterism **STREICHER 27** found a home. The grouping consists of four relatively bright stars in a semi-circle with fainter members stringing out to the south-east.

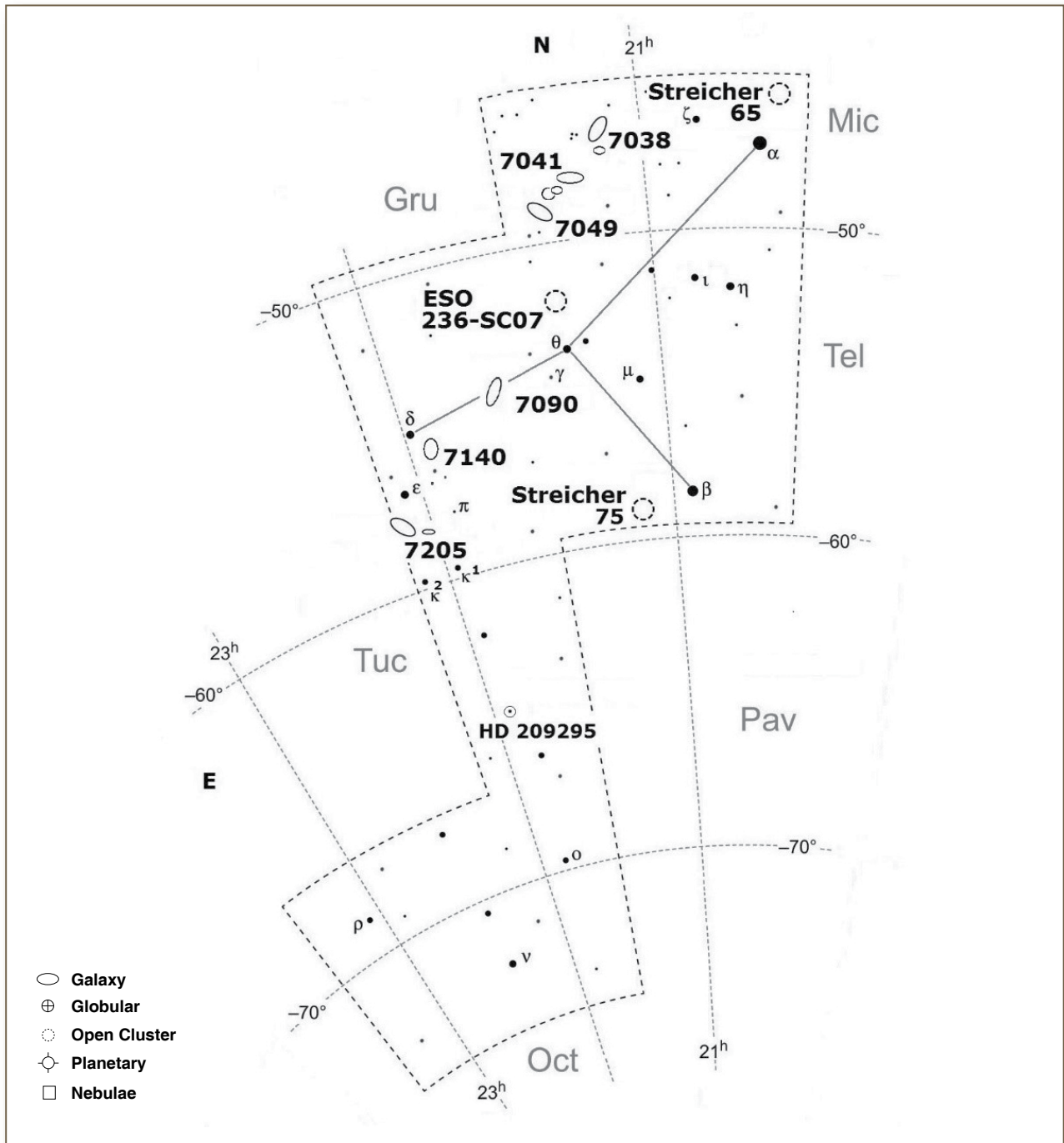
Hugging the border with the constellation Tucana between field-stars I could barely make out **NGC 602**, a two-part cluster. The larger part, reveals a sandpaper impression, positioned more towards the north-east, with a few very faint stars as an extension to the west, giving the cluster an uneven and elongated expression.

There seem to be more hangers in the sky than the Coat Hanger in the constellation Vulpecula and the Mini Coat Hanger in the constellation Ursa Minor. **STREICHER 37**, consist of twelve various magnitude stars in an old-fashioned hanger shape that sported this grouping. The asterism is positioned in a north-west to south-east direction, with the hook pointing south. This small group of stars is situated in a very busy star field and might not be noticed at first. The brightest star in the grouping is the magnitude 9-star, SAO 255920.

The galaxy **NGC 1511** is situated a few arc-minutes south-east of the border with the constellation Reticulum. It appears as a soft spindle in a north-west to south-east direction, with the north-western edge slightly hazy and bulgier. Higher magnification lends the galaxy to show a flatter impression with a relatively bright nucleus.



OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 602	Open Cluster	01h29m.6	-73°33'.4	10.5	34'
STREICHER 27 DSH J0146.4-6447	Asterism	01h46m.4	-64°47'.8	9	9.5'
STREICHER 37 DSH J0244.3-7821	Asterism	02h44m.3	-78°21'.8	10.5	13'
NGC 1511	Galaxy	03h59m.5	-67°38'.5	11	3.5'×1.3'



The constellation of Indus

INDUS

The Proud Indian

What an honour to represent your nation against the stars in the heavens as one of the newer constellations, Indus, which is named after the American Indians in such a constellation. In China it has also been known as The Persian, a title from the Jesuit missionaries (Star Names: Their Lore and Meaning – Allen).



This faint constellation is located between the two magnificent starry birds Grus and Pavo. The constellation was named by Pieter Dirkszoon Keyser, and Frederick de Houtman who mapped the southern sky during an expedition to the East in about 1596. The word “colourful” is synonymous with the American Indians as reflected in their traditional clothing.

My faithful Streicher asterisms are always a blessing to fall back on. **STREICHER 65** is situated 2 degrees north of the magnitude 3 orange-coloured star alpha Indi, which could indicate the head of the Indian figure. The asterism displays an elongated handful of varied-magnitude stars with the brightest magnitude 8.2-star HIP 101319 to the south-east, which may also be a triple star. The stars form an upside-down Y which can be seen very clearly with higher magnification.



STREICHER 65 – Photograph: DSS

Indus is also one of those constellations containing a large number of galaxies. **NGC 7038**, the first of many, can be found in the north-eastern corner. The galaxy is seen as a relatively bright oval in a north-west to south-east direction, displaying a star-like nucleus. Higher magnification however, removes the star-like appearance and one is left only with a slight brightening towards the middle. A lovely magnitude 11 buttery-yellow-coloured star can be seen towards the north of the galaxy.

If you are brave and looking for a challenge, seek out the companion galaxy **NGC 7038A** just 22' to the south. Together with the two galaxies, a lovely triple star completes a triangle to the north-east with colours ranging from yellow to orange.

A degree further south reveals a cluster of galaxies. **NGC 7041**, the northern galaxy, which is quite outstanding against the star field, displays a lovely, very elongated thin east-west oval with a misty edge. **NGC 7041A** which is situated 12' towards the east was just suspected as a drop of haze. The companion sibling NGC 7041B on the western edge of NGC 7041A could not be detected.



NGC 7049 (top left) – Photograph:
Dale Liebenberg

The galaxy **NGC 7049** is situated a further 27' towards the south-east. It is the brightest galaxy of the group, with a magnitude of 10.3, displaying an oval in a north-east to south-west direction. On the southern hazy rim a lovely yellow magnitude 10 star take up prime place, however, it is a foreground star.

Indus lacks known objects like globular clusters and planetary nebulae, but there is a lovely open cluster, **ESO 236-SC07**, which the Indian man appears to be holding against his chest. This bundle of joy is situated 1.7 degrees north of theta Indi, quite outstanding with more than a handful of various coloured stars. Two parts attract the attention immediately. First there is the northern part, consisting of an outstanding half-moon shape running from north-west to south-east, including the brightest magnitude 6.7-star HD 203021. Secondly, the stringy southern part of the grouping in combination creates a shape excellently resembling a hang-glider.

Shift your attention to the magnitude 4.4-star theta Indi, which is situated more or less in the middle area of the figure impression. The double star displays lovely smoky white and orange colours. The system has been previously labelled as multiple in the Hipparcos Input Star Catalogue.

One of the brightest galaxies in Indus can be found halfway between theta and delta Indi. **NGC 7090** is a beautiful, bright, large and very elongated galaxy in a north-west to south-east direction, and is actually a barred galaxy seen edge-on. It displays a sudden brighter nucleus, although not outstanding. The slenderer south-eastern point seems slightly hazier than the fatter and brighter north-western edge. A lone magnitude 12 star towards the middle of the southern part of the galaxy stands out, underlining this rather beautiful, very slender beam of light. Field stars draw the attention towards the northern field of view.



NGC 7090 – Photograph:
Dale Liebenberg

Appearing to be showing due deference, the galaxy **NGC 7140/7141** takes its position at the Indian's feet a degree south-west of delta Indi among faint field stars. The galaxy displays a north-south hazy oval with a nucleus slowly getting brighter, but not outstanding. A prominent triangle of yellow-coloured stars overpowers the southern view of the field. RINGC does not list it as a galaxy, but indicates it as a possible non-existent. This is one of John Herschel's discoveries during his stay at the Cape of Good Hope in 1834 to 1838. Feedback from Auke Slotegraaf indicates that Herschel observed NGC 7140 (h3892) and 7141 (h3893) on two consecutive nights. The former he described as pretty faint, round, gradually brighter in the middle; and the latter as faint, large, round first gradually, then pretty suddenly a little brighter in the middle. For NGC 7140 he recorded a declination of $-57^{\circ}20'25''$ (50' north-west of pi Indi, but the position indicating a orange double star) and for NGC 7141 recorded $-56^{\circ}21'52''$. He commented that it is not improbable that NGC 7141 and NGC 7140 are identical, one or the other being mistaken one degree in polar distance. Still, as both observations are clearly written, and as the difference of $1'28''$ is rather considerable even then, it is necessary to enter them separately. Paturel et al. (1991) note that NGC 7140 = NGC 7141.

Let's now talk about epsilon Indi, which shines with a magnitude of 4.7 and is situated along the eastern edge of the constellation, 2 degrees south of delta Indi. This star is located only 11.8 light-years away from us, the 17th closest, and racing across $5''$ in a year towards the direction of the constellation Tucana. It has now been discovered that epsilon Indi harbours a family of planets. Another star in the constellation, magnitude 6 rho Indi, also harbours a possible planet at least twice the size of planet Jupiter.



NGC 7205 and NGC 7205A – Photograph:
Jim Riffle

A degree further south of epsilon Indi and virtually on the boundary between the constellations Indus and Tucana, the galaxy **NGC 7205** and its companion **NGC 7205A** can be traced down, with one galaxy apparently in Indus and the other in Tucana. NGC 7205 is relatively bright and uneven in texture, elongated north-east to south-west and gradually brighter towards the nucleus. The south-western tip is perhaps thinner than the slightly blunt brighter north-eastern part. It was discovered by Herschel at

the Cape of Good Hope, one of the five brightest members of the Pavo-Indus group of galaxies. The companion member, NGC 7205A, is situated just 8.5' towards the west, which is only a diffuse spot with averted vision. Towards the south of the galaxies the star field is rather busy with varied-magnitude stars.



STREICHER 75 – Photograph: DSS

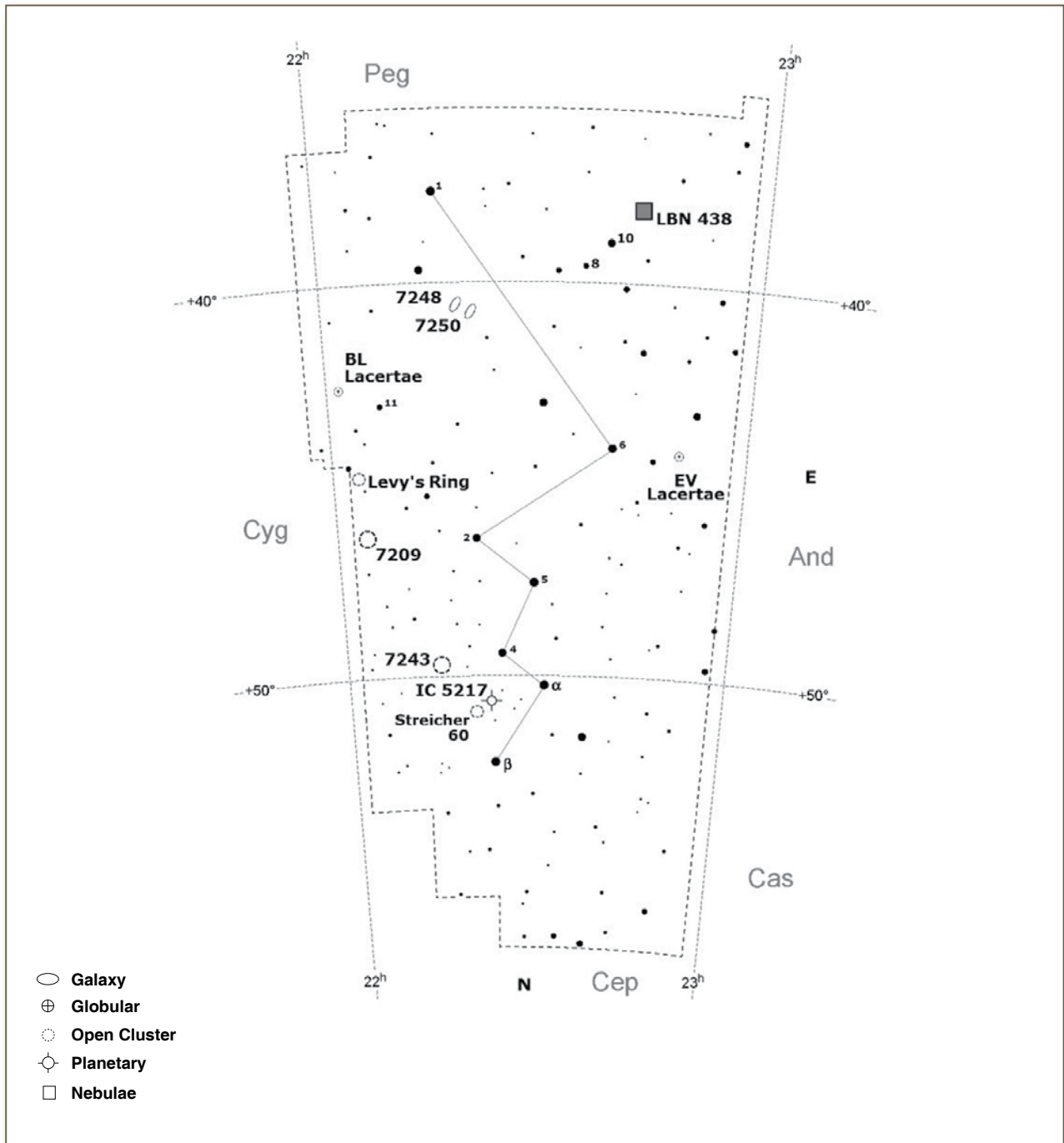
The asterism **STREICHER 75** is situated 45' north-west from the galaxy IC 5095, and close to the southern border of Indus. Inside a wide triangle of stars is a faint grouping of more or less magnitude 11 stars. A prominent half circle of stars is situated towards the southern field of view, a two-part grouping to admire. The grouping is also known as GSC 8805-574 in the Deep Sky Hunters Catalogue.

The far southern part of the Indus constellation is crowded with galaxies which spill over the boundary into the constellations Tucana and Pavo. A special star, however, in the middle of this galaxy colony is the star HD 209295. A South African team has discovered that this star pulsates in two completely different ways at once – at least 11 different frequencies, nine of them relatively slow (1–3 cycles per day) and two much faster vibrations (about 14–26 cycles per day). The reason is that HD 209295 and an invisible companion star orbits each other every 3 days (Mnassa, December 2001).

Some time ago, when I visited a nature park in South America, my path crossed that of the true American Indian people. I vaguely remembered then that there is a constellation referring to them in the starry skies, but never thought that I would someday be able to write an article on the now well-known Indus constellation.



OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 65 DSH J2032.5-4518	Asterism	20h32m.5	-45°18'.3	10.9	3.5'
STREICHER 75 GSC 8805-574 Group	Asterism	21h13m.2	-59°25'.8	11	3.8'
NGC 7038	Galaxy	21h15m.2	-47°13'.0	11.6	3.3'×1.5'
NGC 7038A	Galaxy	21h15m.3	-47°37'.2	13	1.1'×0.6'
NGC 7041	Galaxy	21h16m.5	-48°22'.0	11.2	3.3'×1.4'
NGC 7041A	Galaxy	21h18m.0	-48°24'.4	13	1.6'×1.3'
NGC 7049	Galaxy	21h19m.3	-48°34'.0	10.3	4.3'×3.2'
ESO 236-SC07	Open Cluster	21h21m.5	-51°49'.2	9	21'
NGC 7090	Galaxy	21h36m.5	-54°33'.3	10.7	8.1'×1.4'
NGC 7140 NGC 7141	Galaxy	21h52m.2	-55°34'.4	11.9	3'×1.4'
NGC 7205A	Galaxy	22h07m.5	-57°26'.6	13.5	1.2'×0.8'
NGC 7205	Galaxy	22h08m.5	-57°25'.4	11.2	3.7'×1.9'



The constellation of Lacerta

LACERTA

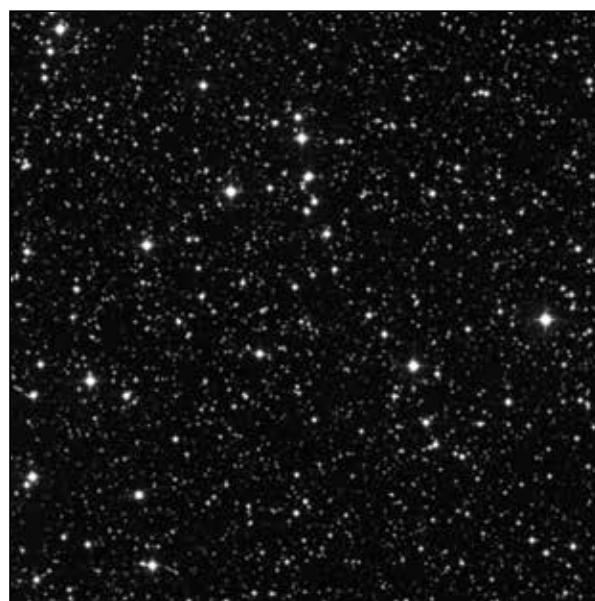
The Mysterious Lizard

Mystery is to be found everywhere, veiled in darkness and unknown to us. And so it is with the constellation of Lacerta, which is enveloped in mystery. Since I had the opportunity to study it when I visited an Astro camp in the northern hemisphere, I decided I just had to unravel it.

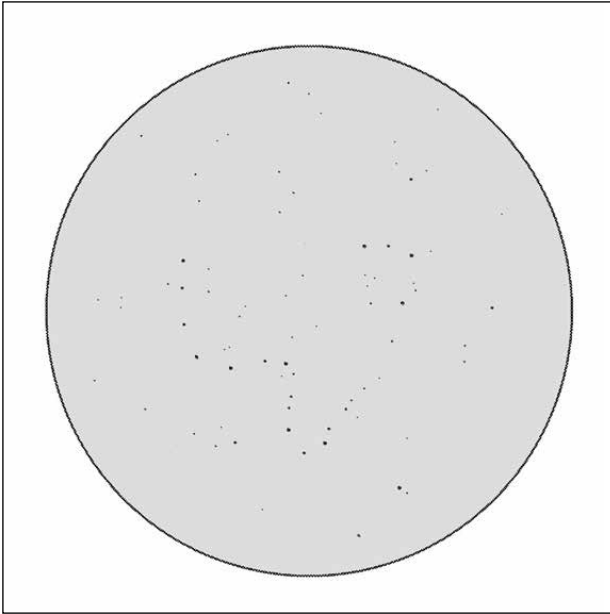
Firstly, the name Lacerta means "lizard", whether a large or small lizard in this case, who knows what the Polish astronomer Johannes Hevelius was thinking when he named the constellation in the late 17th century. Lacerta is relatively small in composition and weight among the constellations Cygnus, Cepheus, Andromeda and Pegasus, but sadly beyond reach in the southern part of the world.

The constellation had a lot to offer in terms of open clusters, but a planetary nebula is the object to search out first. The star beta Lacertae on the northern tip in combination with other stars forms the constellation outline in an impressive zigzag line running southwards. Situated in a triangle with beta and alpha Lacertae, the planetary nebula **IC 5217** can be found. At first the nebula appears as a small, out-of-focus dot. With higher magnification the magnitude 12.6 nebula appears slightly oval with a pale grey colour. With a careful eye and averted vision, it grows, but no central star was spotted, although some amateurs claim to spot a very faint star on the north-eastern edge of the nebula.

However, a lovely, long string was spotted a few years ago 7' towards the north-west of the planetary nebula. **STREICHER 60**, also listed as DSH J2223.3+5103 in the Deep Sky Hunters Catalogue, drapes nearly 8' in length from north to south-west with no fewer than a hand full of magnitude 11 stars.



STREICHER 60 – Photograph: DSS



NGC 7243 – Open Cluster

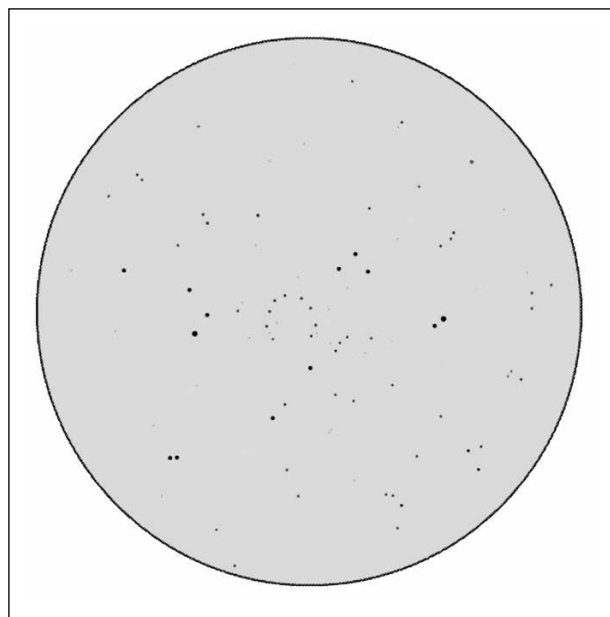
In an isosceles triangle between alpha and 4 Lacertae, towards the west, the first of the multitude of clusters Lacerta has in its boundaries, is **NGC 7243**. The first impression was of three groupings in a somewhat elongated formation north-east to south-west. The brighter stars are situated more to the west, with a tighter grouping east which extends south in short strings of faint stars. The equal magnitude 9 double star Struve 1890 is situated near the centre. This cluster has been nicknamed the Broken Heart with the brightest stars roughly outlining a starry heart symbol broken open along the northern side, where a

few stars seems greatly misplaced. The complete grouping consists of about 50 stars.

Close to the Cygnus border 2.5 degrees west from 2 Lacertae the lovely curly open cluster **NGC 7209** winds its way over an area of 25'. The cluster gives an elongated impression with relatively faint stars fairly compact. The brightest stars in the cluster snake north to south across the group in a wide S-shape. Stars string outward to the western side with fewer stars on the eastern side. Looked at in a wide field of view it appears as a pentagon shape. Just 1.4 degrees north-east of NGC 7209 is an attractive curve of bright, colourful, outstanding stars on which to try out your colour perception. Their magnitudes are 6.2, 6.5 and 5.1, with colours white, bluish and yellow to orange.

The star 6 Lacertae is a degree west from the young star EV Lacertae in the eastern part of the constellation. This pipsqueak Type-M star unleashes a monster flare, picked up on 25 April 2008, by the Swift satellite, the brightest flare ever seen coming from a star, emitting only a few percent of the Sun's light and having only a third of the Sun's mass. This flare was thousands of times more powerful than the greatest observed solar flare. The star remained bright in X-rays for 8 hours before settling back to normal. EV Lacertae is a run-of-the-mill red dwarf, one of the most common type of stars in the universe. At a distance of only 16 light-years EV Lacertae is one of our closest stellar neighbours, but because of its feeble light output, its apparent magnitude is only 10. The star had been thought to be a variable, but in the 1970s it was discovered that it could be the brilliant core of a distant elliptical galaxy (Mnassa, August 2008).

The nice thing about searching out asterisms is the story-telling part of these small groupings with fewer stars than the better known larger open clusters. One such is **LEVY'S RING**, consisting of magnitude 12 to 13 stars. The unrelated stars form a completely smooth half-ring, but sadly, the ring is open at its southern end. It was discovered on the night of 2 January 2000 by David H. Levy and his wife Wendee. The asterism is to be found nearly on the border with Cygnus, close to NGC 7000.



LEVY'S RING - Asterism

Further south is probably Lacerta's most famous object, BL Lacertae, an active galaxy with an active galactic nucleus (AGN) and named after its prototype. In contrast to other types of active galactic nuclei, BL Lacertae is characterised by rapid and large-amplitude flux variability and significant optical polarisation. When compared with the more luminous active nuclei of quasars with strong emission lines, BL Lacertae have a spectrum dominated by an active galaxy. It was first discovered by Cuno Hoffmeister in 1929 but was originally thought to be an irregular variable star in the Milky Way galaxy and so was given a variable star designation. In 1968 the "star" was identified by John Schmitt at the David Dunlap Observatory as a bright, variable radio source. In 1974 Oke and Gunn measured the redshift of BL Lacertae as $z = 0.07$, corresponding to a recession velocity of 21 000 km/s with respect to the Milky Way.

Although Lacerta is known for ample open clusters, it does have a few faint galaxies to offer. Two galaxies just 18' apart are situated in the southern part of the constellation. **NGC 7248** and **NGC 7250** look nearly identical as two equal ovals in a north-west to south-east direction. NGC 7248, the brighter of the two, has a very bright nucleus and a slightly hazy edge. NGC 7250, in comparison, brightens up suddenly towards the centre, but not in a star-like way. An orange-coloured magnitude 11.5 star is situated on its south-eastern tip.

Locate 10 Lacertae in the far southern part of the constellation to point the way to **LBN 438**, a Lynd's Catalogue dark nebula. Illuminated through interstellar radiation, the dusty nebula is, however, very faint. On either side of the dusty nebula brighter stars make the star field stand out beautifully. It is one of the faintest Lynd's objects in the catalogue and not at all easy to glimpse. A string of several magnitude stars run alongside this dark area towards west end with a magnitude 9 deep orange coloured star at the southern end. Halfway in this string a small knot of stars comes to light. The little grouping consists of a few very faint stars seen with high magnification through a medium size telescope.

I accepted the challenge of trying to weave some reality into the mystical Lizard, given my favourable view of the far north, and was pleasantly surprised.



The Uranometria card of 1603

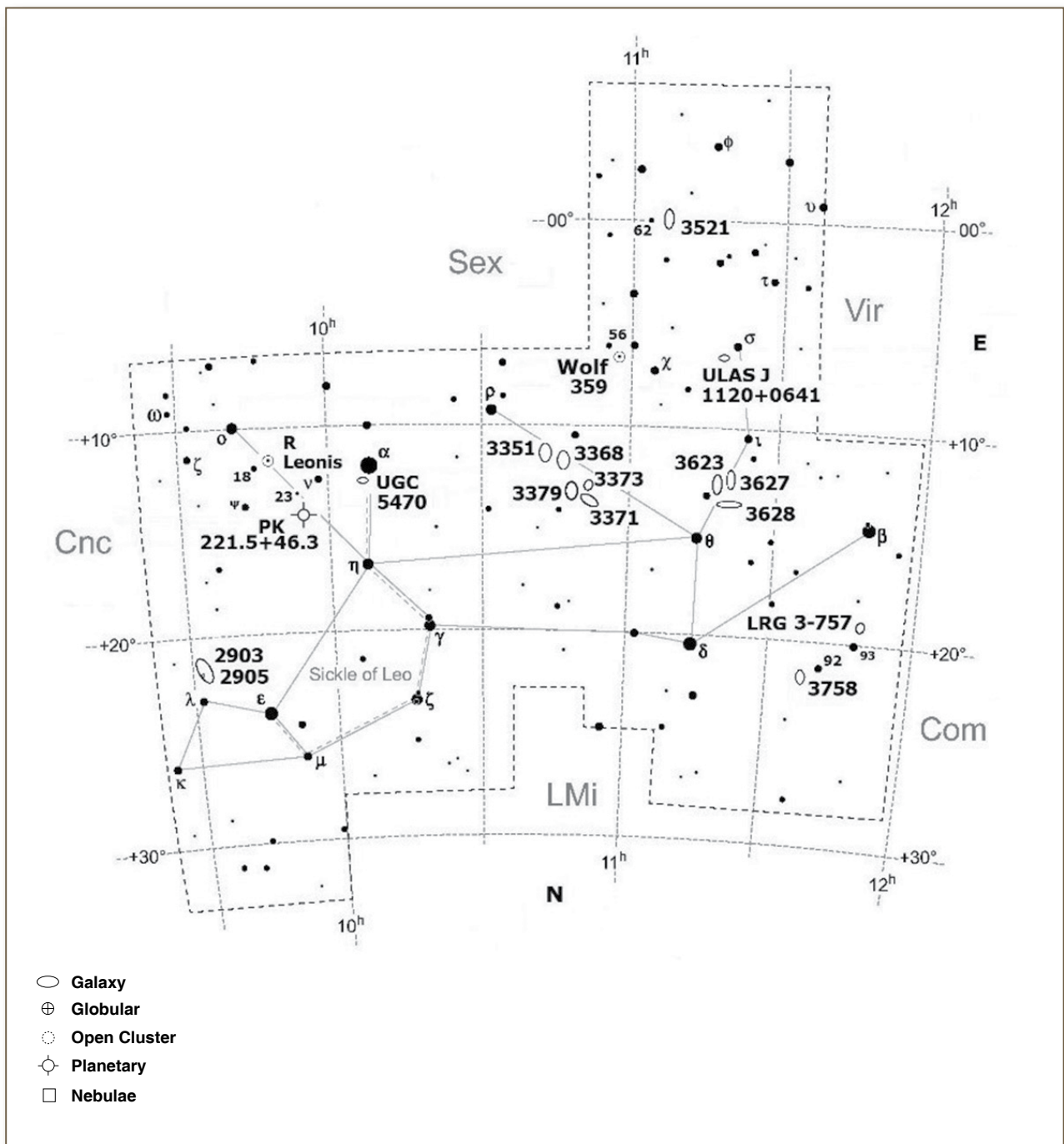


This beautiful chart was drawn by Charles Messier in the late 1700s and shows the La Lezard at far left

OBJECT	TYPE	RA	DEC	MAG	SIZE
BL Lacertae	Galaxy	22h02m.7	+42°16'.7	17	Redshift 0.07
LEVY'S RING	Asterism	22h04m.4	+45°09'.0	10	6'
NGC 7209	Open Cluster	22h05m.2	+46°29'.8	7.7	25'
NGC 7243	Open Cluster	22h15m.3	+49°53'.0	6.4	21'
NGC 7248	Galaxy	22h16m.8	+40°30'.0	12.4	1.8'x0.9'
NGC 7250	Galaxy	22h18m.3	+40°35'.0	12.6	1.7'x0.8'
STREICHER 60 DSH J2223.3+5103	Asterism	22h23m.3	+51°03'.6	9.5	11'
IC 5217	Planetary Nebula	22h23m.9	+50°58'.0	12.6	6"
LBN 438	Dark Nebula	22h41m.8	+37°42'.8	8-10	30'
EV Lacertae	Star	22h46m.8	+44°20'.2	10	Spectral Type-M4



Heliobolus lugubris, which is a species of Lacertidae



The constellation of Leo

LEO

The Lion Roars Tonight

The constellation Leo possesses a measure of dignity and justifiably reflects a true mental picture of the animal it has been named after. In nature the lion is regarded as the king of the animal kingdom, so the presence of a lion constellation should not be an unusual idea. The image itself is easily recognisable and in some ways brings to mind the lion image found in Egyptian records. From the southern skies the image is seen upside down, but that should not deter us from admiring it, as the objects, mainly galaxies, found within the constellation, bring ample reward.



Leo is one of the original Greek constellations representing one of the twelve labours of Hercules. As we look out from the plane of our Milky Way, the constellation is host to many galaxies, but there are also a few surprises which make a visit to this celestial animal very interesting. The planets Venus and Jupiter, in presumably towards the western part of the constellation, appear to fuse together to look like one object in II BC, a sight no one alive had ever seen.

The constellation is also famous for the ecliptic that runs through it just south of magnitude 1.4 alpha Leonis, better known as the star Regulus. Regulus is the 21st brightest star, 75 light-years away and shines with a super-brilliant white colour. It is also a multiple system with a white dwarf companion orbiting it every 40 days. Regulus, referred to as the heart star, is situated at the western base of the well-known Leo sickle asterism.

The faint galaxy **UGC 5470** or Leo I, is situated only 28' north-west of Regulus. Leo I is a dwarf spheroidal galaxy discovered in 1950 by Albert George Wilson on a photographic plate taken with the 48-inch Schmidt camera at Palomar Observatory. Although the galaxy is not all that faint, it is almost impossible to spot in the overwhelming glare of Regulus, which is about 10 000 times brighter, and on top of that the dwarf galaxy is a staggering 800 000 light-years further away. After trying my ut most best putting Regulus out of the field of view, I suspect only a haze with averted vision. However, there is a nice asterism of stars to appreciate that is forming a triangle with Regulus and the galaxy in the same field of view. Another galaxy, IC 591 nearly magnitude 15 is situated slightly further west.

West of alpha Leonis the star R Leonis was the first long-period Mira-type to be discovered in the year 1782, about 600 light-years away. It varies from a maximum brightness of 4.3 to 11.6 over a period of 312 days. The estimated magnitude was found to be around 8+ when I observed it on the night of 26 February 2014, shining with a nice orange to red colour.

The very faint planetary nebula **PK 221.5+46.3**, discovered by Ellis Grayson Bond from Palomar Sky Survey prints, is situated nearly a degree north of the star 23 Leonis. It is a large nebula with a low surface brightness and as suspected there was just no trace of it through my ordinary telescope. The nebula is about 1500 light-years distant with a very hot white dwarf star, with the suggestion that this star could be a binary. Sadly, the nebula can be appreciated only through the eye of Hubble.



NGC 2903 and NGC 2905

Photograph: Second Digitized Sky Survey

A galaxy with a twist is **NGC 2903**, situated about 3.8 degrees south-west of epsilon Leonis. NGC 2903 is a barred spiral galaxy discovered by William Herschel, who catalogued it 1784. It is an oval in a north-east to south-west direction, somewhat larger than average and not too faint to appreciate. The challenge, however, is to spot the small hazy spot **NGC 2905** inside the flimsy, thicker, brighter northern edge of NGC 2903.



LRG 3-757 – Photograph: DanSpace77

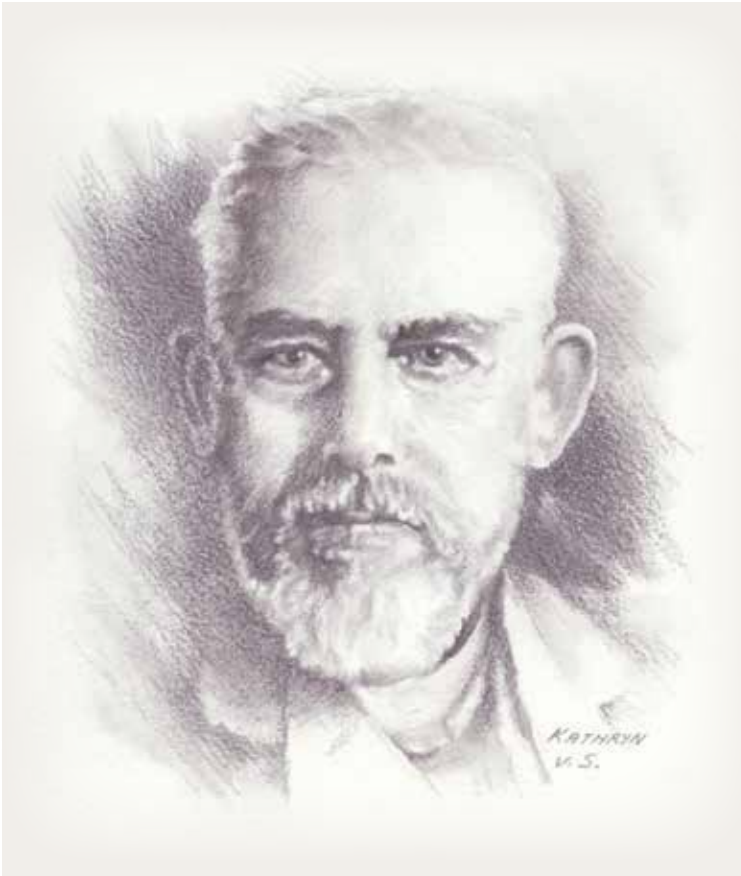
South of the star 93 Leonis is a very special object named **LRG 3-757**, an “Einstein Ring” discovered in 2007, situated in the far north-eastern part of the constellation. It is the deformation of the light from a luminous red galaxy into a ring through gravitational lensing of the source’s light by an object with an extremely large mass, which occurs when the source, lens and observer are all aligned. Do visit the spot, but, notice, there is a very nice yellow-coloured double star just south of the object! Einstein’s Ring is sometimes referred to as the Cosmic Horseshoe.

North of Regulus is the magnitude 3.4 eta, a Type-A supergiant star 2000 light-years away. Further north is the double star gamma, which also has the faint galaxy NGC 3123 as a close neighbour south-east. Towards the bend of the clear sickle impression is the magnitude 3.4 zeta Leonis, then the red-coloured magnitude 3.8 mu Leonis, and towards the west-end of the sickle, is the magnitude 2.9 epsilon Leonis.

Probably one of the most concentrated groups of galaxies can be seen squeezing up close to one another all along the Lion figure. Halfway between Regulus and magnitude 3.3 theta Leonis, is a well-known group of three galaxies which have been observed by many. **NGC 3379** or Messier 105 is an elliptical giant galaxy discovered by Pierre Méchain in 1781. The galaxy displays a large bright glow with an even surface brightness. With higher magnitude it grows slowly brighter towards a tiny nucleus. The galaxy 6' towards the north-east is **NGC 3371**, an elongated spiral in a north-east to south-west direction with a nearly stellar nucleus. The third member of the group towards the south of M105 is **NGC 3373**, which can only be described as faint and round, not at all easy to spot, although deep photographs show a mottled centre and loosely spiral arms.

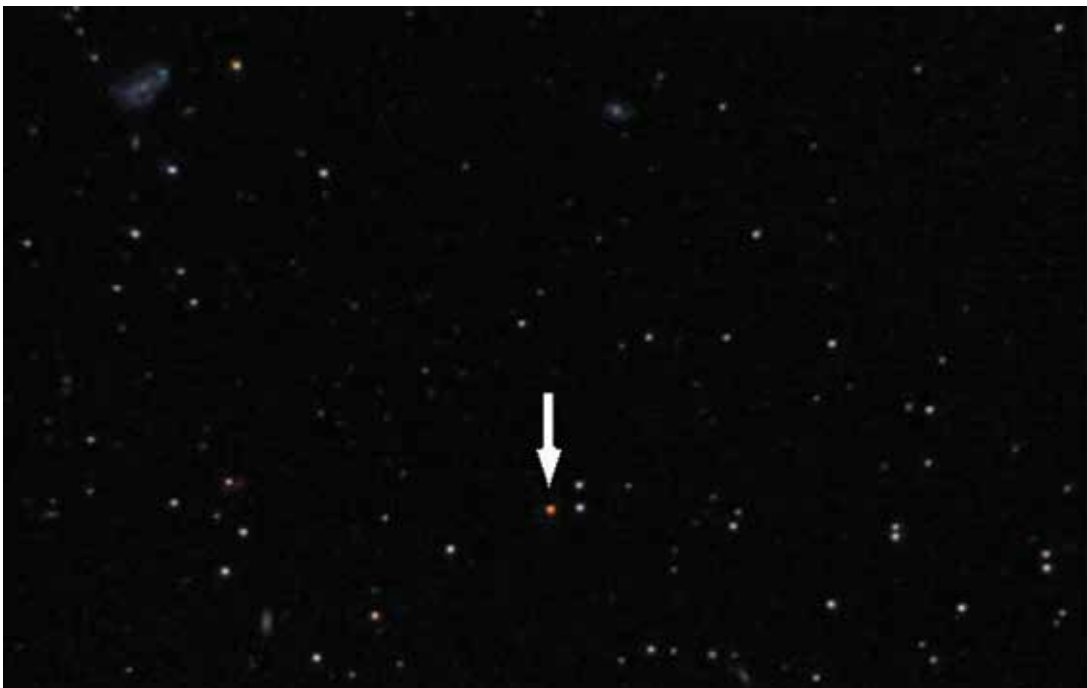
Only a degree further south-west are two galaxies, **NGC 3351**, Messier 95 and **NGC 3368**, Messier 96, also discovered by Méchain, and situated only 40' apart. M95 is not very bright, but one can glimpse it as a round glow with a halo around it, brightening to a sudden oval nucleus. With very high magnification slender hazy parts can be seen on the sides of the nucleus which could well be delicate spiral arms, but dark skies are essential. M96 is a beautiful, large bright galaxy, extending into a sudden bright nucleus. The galaxy also displays a soft halo, slightly grainy covered in haze with a dusty section to the south-western part. The much talked about but disappointing comet C/2012S1 was discovered by ISON (International Scientific Optical Network) beyond the orbit of planet Jupiter. On 21 September 2012 it was just a stone's throw away from these two galaxies. If the comet should reach the status of "a very bright comet", as predicted, it could make a great picture to remember.

Situated between magnitude 4 sigma Leonis and the galaxy NGC 3624 is the quasar **ULAS J1120+0641**. According to a paper published in *Nature* on 6 December 2012, it is one of the most distant quasars that contains no heavy elements. The galaxy is 13.3 billion light-years away and gives us a glimpse into what the universe was like about 700 million years after the Big Bang. According to the evidence the galaxy is made up almost entirely of hydrogen that has not yet become stars. It is the first-time astronomers have seen a galaxy so young that its gas has not yet collapsed into stars. ULAS J1120+0641 were discovered by the Infrared Deep Sky Survey, using the United Kingdom Infrared Telescope located in Hawaii (Astronomy, April 2013).



The Leo constellation is also home to **Wolf 359**, the third closest star to our solar system after the alpha Centaurus group and Barnard's star. It is situated 48' north of the star 56 Leonis and been classified as a cool Type-M dwarf star with a magnitude of 13.5 only 7.7 light-years away. The star is one of the faintest and lowest-mass stars known and relatively young, with an age of less than a billion years, and moves about 4.7" per year. In a busy star field, it was just possible to pick up the flickering light of Wolf 359 with averted vision.

Maximilian Franz Joseph Cornelius Wolf (1863–1932) discovered this nearby star in 1918. He was a German astronomer and a pioneer in the field of astrophotography, chairman of Astronomy at the University of Heidelberg and Director of the Landessternwarte Heidelberg-Königstuhl Observatory from 1902 to 1932.



Wolf 359 – Photograph: drewexmachina

The galaxy **NGC 3521** is taking control of the far southern part of the constellation and is just 33' east of 62 Leonis. First impression shows the relatively bright galaxy in a slightly elongated north-south direction. Higher magnification brings to the fore a large bright nucleus with a hazy envelope that fades out towards the edge.



NGC 3521 – Photograph: Dale Liebenberg

The tail-end star is beta Leonis, better known as Denebola, (it literally means “tail of the Lion”), a Type-A3 star similar to alpha Canis Major (Sirius) and about 40 light-years away. The number of galaxies south of the Lion’s tail is like the hair on a lion’s back so to speak. But easy enough to find is the trio of galaxies **NGC 3623** (Messier 65), **NGC 3627** (Messier 66) and **NGC 3628**, situated about halfway between theta and iota



NGC 3627 – M66 and NGC 3623 – M65
Photograph: Dale Liebenberg

Leonis. The group is also known as the Leo Triplet and is about 30 million light-years away. M65, the western member of the trio, is a typical elongated spiral extended in a north to south thin oval. Higher magnification brings out a diffused, knotted, uneven appearance with a bright nucleus and diffuse halo. M66, situated 20' towards the east, is the brightest member, with an uneven light-spread over the large surface. It displays a soft outer edge that fades towards an attractive, bright, large elongated nucleus. Some observers claim to see an extension that gives the galaxy a sort of gentle curve. However, deep photographs show that the southern spiral arm is slightly displaced. NGC 3628 lies just 35' north of M66 and appears needle-thin with its light spread softly over the surface. Careful observation brings to the fore a faint elongated nucleus. The trick here is to spot the faint dust lane that cuts through the lower southern part of the galaxy. Classed as one of the flattest galaxies in the sky, it is also known as the famously known King Hamlet’s Ghost Galaxy. To appreciate this galaxy best, have a look at the beautiful Hubble picture of it, but do not neglect your own observation through an ordinary telescope if there is a chance to do so.

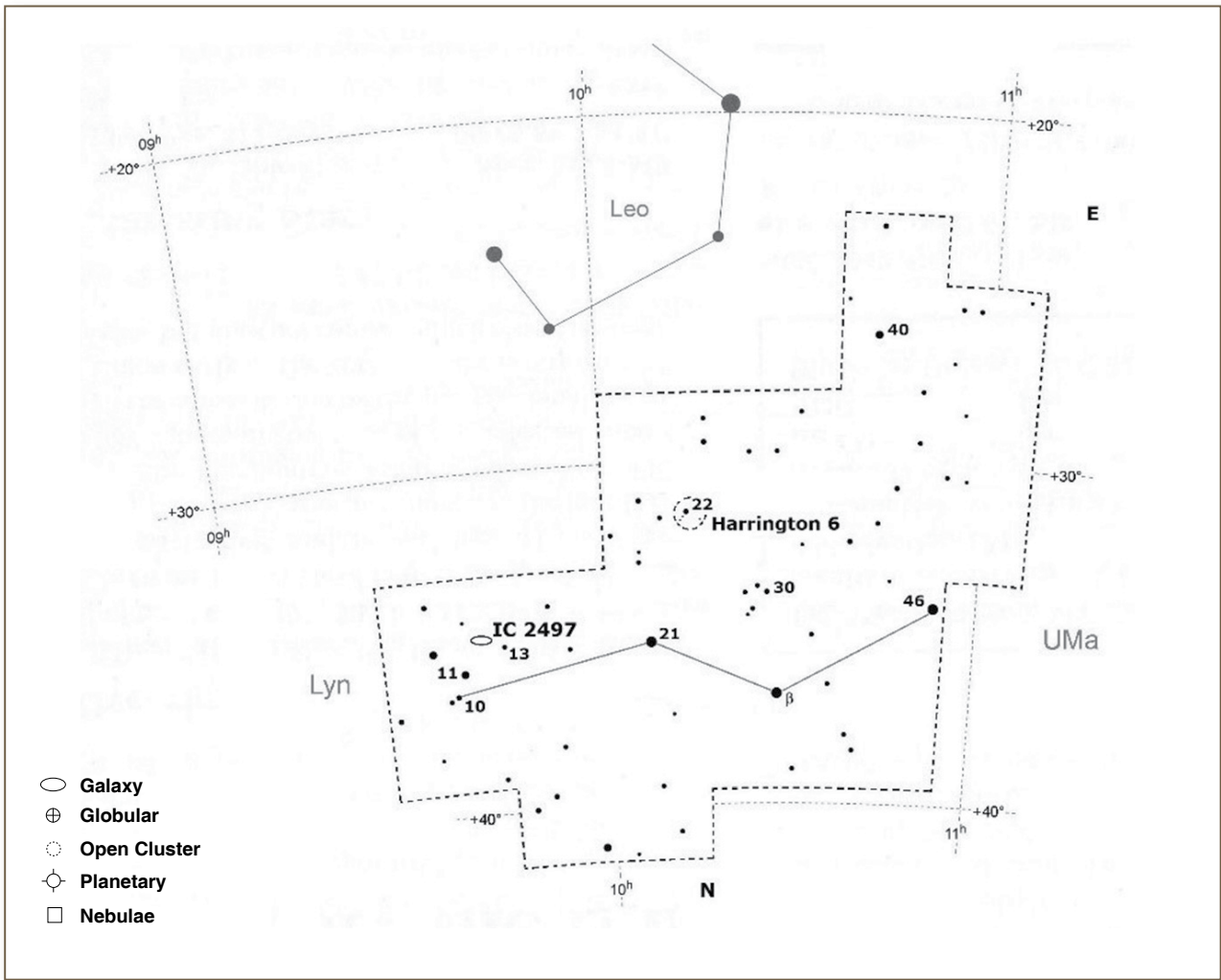
The constellation is strewn with galaxies, so it would be a very good idea to have a detailed star chart at hand to make identification easier. Riding along on the Lion's tail, close to the eastern border is an especially rare type of galaxy, **NGC 3758**, just west of 92 Leonis. Strange but true, astronomers discovered two active super-massive black holes in NGC 3758, (Markarian 739), which is about 425 light-years away. What is amazing is that 11 000 light-years separate the two cores. It is a known fact that massive galaxies have black holes at their cores, but to find two of them both feeding on nearby material and spewing out high-energy radiation is extraordinary. News of the discovery, led by Michael Koss of the University of Maryland, College Park, appeared in the *Astrophysical Journal Letters*.

In nature the lion has a mighty roar – and it is entitled to it! And as you can see, its heavenly counterpart, the constellation Leo, equally has more than enough reason to make its presence boldly and loudly known.

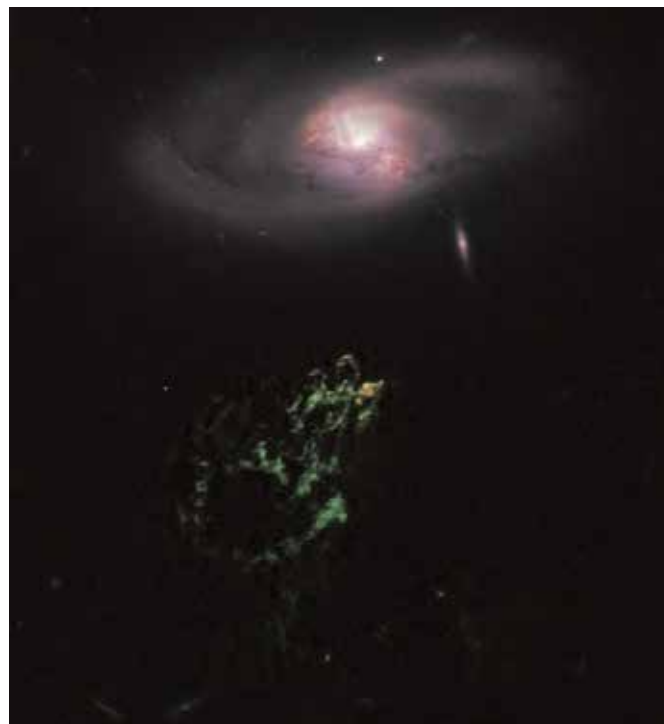


NGC 3193, NGC 3190, NGC 3187 and NGC 3185 (bottom right)
Hickson 44 – Photograph: Dale Liebenberg

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2903 NGC 2905	Galaxy	09h32m.2	+21°30'.8	9.7	12.6'×6'
R Leonis	Mira-type Star	09h47m.5	+11°25'.7	4.4 11.3	*
PK 221.5+46.3	Planetary Nebula	09h53m.0	+13°44'.8	13	720"
UGC 5470 Leo I	Galaxy Dwarf	10h08m.4	+12°18'.5	11	9.8'×7.4'
NGC 3351 Messier 95	Galaxy	10h43m.9	+11°42'.1	9.7	7.8'×4.6'
NGC 3368 Messier 96	Galaxy	10h46m.7	+11°49'.1	9.2	6.9'×4.5'
NGC 3379 Messier 105	Galaxy	10h47m.8	+12°34'.8	9.3	5.3'×4.8'
NGC 3371	Galaxy	10h48m.1	+12°37'.7	9.9	5.5'×2.9'
NGC 3373	Galaxy	10h48m.7	+12°31'.9	11.9	2.7'×1.1'
Wolf 359	Star	10h56m.4	+07°00'.8	13.5	*
NGC 3521	Galaxy	11h05m.8	-00°02'.5	9	12.3'×6.5'
NGC 3623 Messier 65	Galaxy	11h18m.8	+13°05'.4	9.2	8.7'×2.3'
NGC 3627 Messier 66	Galaxy	11h20m.1	+12°59'.5	8.9	8.2'×3.9'
ULAS J 1120+0641	Quasar	11h20m.2	+06°41'.4	-	-
NGC 3628	Galaxy	11h20m.3	+13°35'.3	9.5	14'×4'
NGC 3758	Galaxy	11h36m.4	+21°36'.2	14	0.5'×0.5'
LRG 3-757 Einstein Ring	Galaxy	11h48m.5	+19°30'.3	20	15"



The constellation of Leo Minor



IC 2497 – Photograph: Wikipedia

LEO MINOR

The Lesser Lion

Leo Minor, the Lesser Lion constellation almost piggybacks on the famous old greater Leo constellation. In French the smaller constellation is known by the charming-sounding name Petit Lion. The Germans call it der Kleine Löwe, and for the Italians it's Lencino. The Polish astronomer Johannes Hevelius used only 20 stars in 1687 to define the shape which nestles between Ursa Major and Leo.



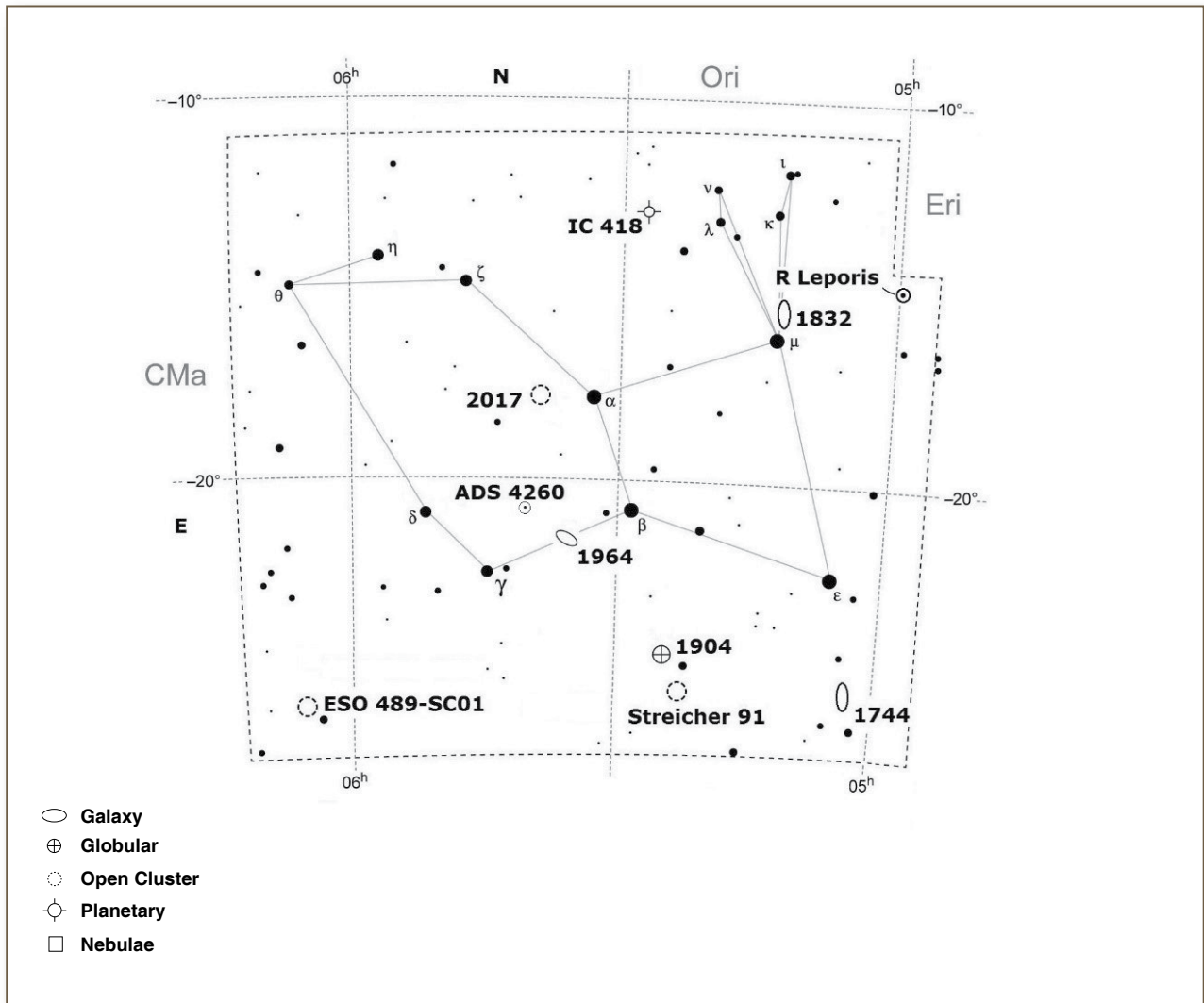
The relatively small, but substantial constellation contains a special object discovered by Dutch school teacher Hanny van Arkel in 2007 while she was participating as an amateur volunteer in the Galaxy Zoo project. She found, photographically, a greenish flimsy haze 24" south of the galaxy **IC 2497**, now popularly known as Hanny's Voorwerp (Hanny's Object). The extremely faint magnitude 14.9 galaxy is situated less than 30' west of the lovely bright yellow-coloured 13 Leonis Minoris. Brian Skiff notes that Hanny's Voorwerp appears to be a giant patch of O-III emission.

The SDSS catalogue shows Hanny's Voorwerp only as a single point-source type of entry, with a Sloan magnitude of 18.8. Since it covers a fair bit of sky, this must be a lower limit on the brightness, so perhaps something between 17 or 18 might be closer to correct. Skiff also notice that the SDSS images of IC 2497 show that the galaxy is absorbing a companion object whose nucleus lies a few arc-seconds south-west of the main galaxy's centre. Hanny's Voorwerp glows green from high-energy radiation that once emanated from an active quasar at the centre of IC 2497. Researchers have found about 20 of these objects all within one billion light-years of us.

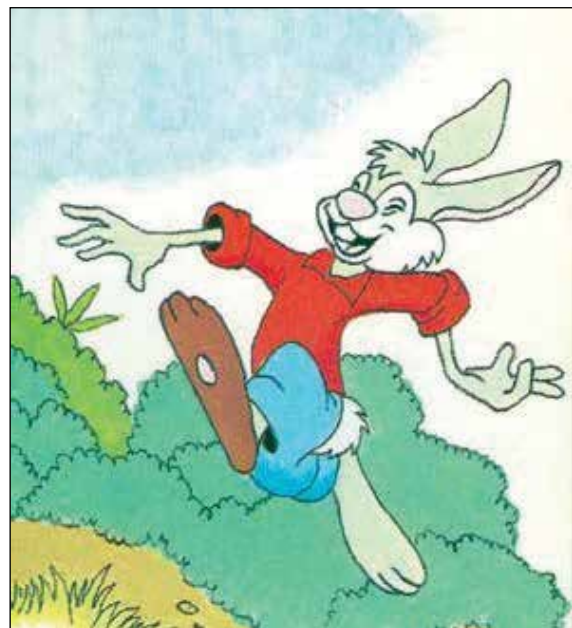
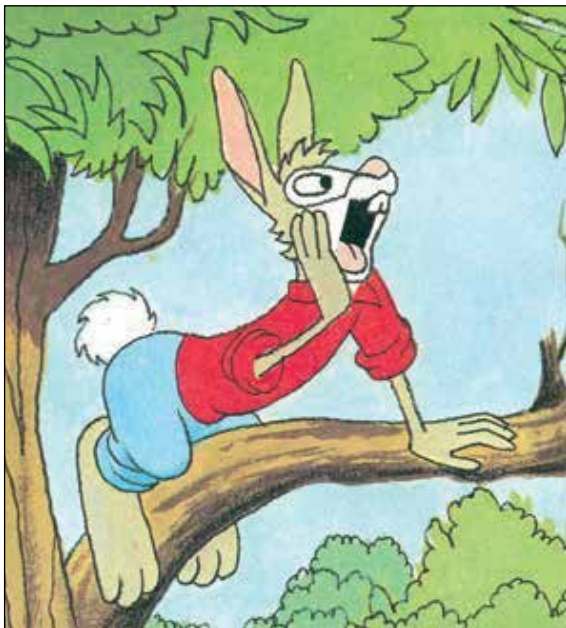
In the middle part of the constellation is a bunch of bright stars known as **HARRINGTON 6**, a lovely grouping of a dozen yellow coloured stars which includes the star 22 Leonis Minoris. It is named after Phil Harrington, author of many books on astronomical equipment, observing selected sky targets and information on solar and lunar eclipses.

This part houses many animal named constellations, not to be afraid of, but to befriend and to take you into a rare celestial wonder star park.

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 2497	Galaxy	09h41m.4	+34°42'.8	14.9	0.6'×0.3'
HARRINGTON 6	Open Cluster	10h13m.5	+31°27'.0	8.5	42'



The constellation of Lepus



LEPUS

A Storybook Rabbit

Lepus the Hare is generally seen as the animal being chased by Orion's hunting dog, Canis Major, but looked at differently it could also be seen as a chair for Orion the hunter.



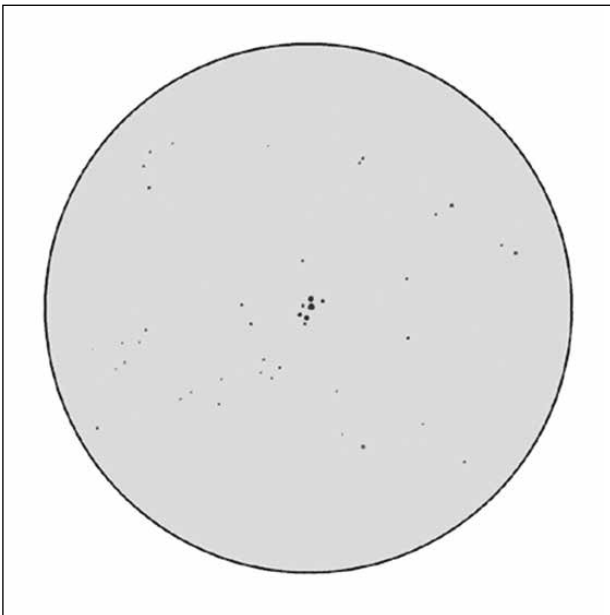
Looking at the constellation, the magnitude 3.2 mu Leporis could represent the rabbit's large eye, while kappa and lambda further to the north represent the two ears. These parts are directed westwards within the constellation, with Canis Major hot on the rabbit's heels from the east.

Not only can an animal story be seen in the star formation, but various land animals are also frequently associated with children's story books. The rabbit is a little animal, a popular favourite, and enriches a child's imagination to an exciting level of enjoyment. A story like this, from way back when, about "*Farmer Rabbit and his friends*", stole the heart of my grandson Kirstein, and needless to say, I've had to read the story to him countless times. Now people are wondering whether the rabbit constellation has any connection with the little animal we know as a rabbit. What is beyond question, however, is that the Lepus constellation holds wonderful stories in the objects located in it.

The northern part of the constellation houses a special planetary nebula, **IC 418**, with an outstanding blue-green colour, one of the best objects in its class. Although small in size, the impression is that of a light-bulb peeping through a misty halo. With higher magnification an outer frosted halo can be seen glowing around a magnitude 10 star. The north-western side is slightly hazier, but overall the planetary nebula is well outstanding against the background star field. There's something about IC 418 that leaves me with a somewhat spooky feeling. This strange object with the nickname Spirograph Nebula appears somewhat three-dimensional in the Hubble picture, with random lines on the surface. The edge is well-defined and as a whole it is covered with a strong reddish to orange glow. IC 418 was the first planetary nebula to be detected by photographic spectroscopy (objective prism) by Williamina Fleming on 26 March 1891 at Harvard University.

NGC 1832 is situated only 30' north-west of mu Leporis and in sight of the hare's bright eye. A pretty, oval-shaped galaxy in a north-south direction with an outstanding bright nucleus, although not star-like. With careful observation and high magnification through moderate telescopes, a few bright spots can be picked up on the surface of the galaxy.

The long-period pulsating red variable star R Leporis, better known as Hind's Crimson Star, can be found close to 30' east of the Eridanus constellation boundary. The variability of approximately 432 days was detected again from observations made between 1852 and 1855. Historically, R Leporis varied between magnitude 5.5 and 11.7, but lately it hasn't been seen brighter than about magnitude 6. This type of red star, also known as a Mira-type, displays strong bands caused by carbon compounds. R Leporis has its own very distinctive red hue which changes from deep orange to a strong ruby-red.



NGC 2017 – Open Cluster

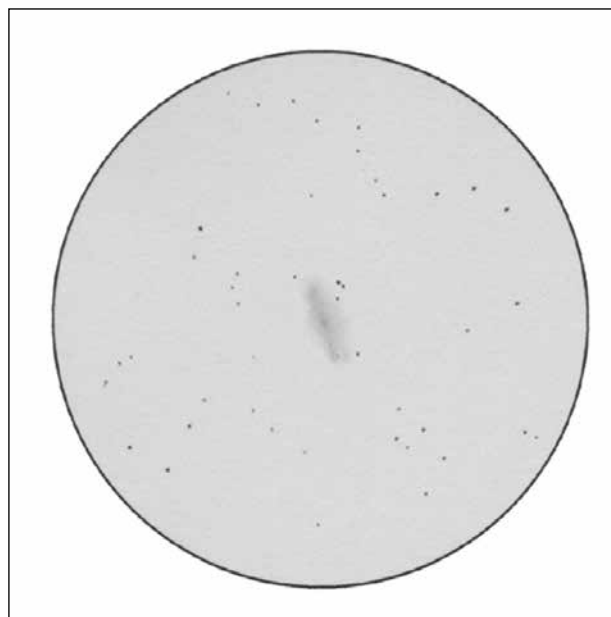
The magnitude 2.6-star alpha Leporis, situated more or less in the middle of the constellation, is also known as Arneb, which is Arabic for Hare. The unusual open cluster **NGC 2017**, which would be better referred to as an asterism, or a multiple star group, is situated just 1.5 degrees east of alpha Leporis. Five stars with an unusual appearance stand out clearly against the background star field. With its variety of colours, it can truly be described as one of the most beautiful stellar groupings.

The magnitude 6.4 primary star of the grouping has a very smooth grey-blue colour. Towards the south is a yellow magnitude 8.8 star, accompanied by a fainter member. On the eastern side of the group the magnitude 10 star displays an ashy colour. A magnitude 7.7 star is located on the northern edge and displays a strong orange colour; it is also the most outstanding member. To conclude the grouping the magnitude 8.2, a slightly dirty-yellow-coloured star, is situated further west. These stars seem to form a physical system. Hartung describes it as an "attractive group of six stars, which shows different colours in blue, yellow, orange, blue and ashy".

The characteristic arched back of the starry hare is represented by the star's theta and zeta Leporis, and with imagination the star eta Leporis can be seen perhaps as the fluffy tail?

The double star ADS 4260 forms a triangle to the north with the bright star's beta and delta Leporis and is by far one of the most beautiful contrasting-colour stars. The magnitude 6.9 primary shines crispy white, while its magnitude 7.9 companion is a seldom-seen blue-purple colour. The pair is currently in a separation of 11" with a position angle (PA) of 123°.

Situated only 1.5 degrees south-east of the beautiful yellow-coloured beta Leporis is **NGC 1964**, a relatively bright galaxy. First impression brings to the fore the sight of a very faint comet, slightly elongated in a north-east to south-west direction. The edge of the galaxy appears to be very hazy, fading away into a nebulous veil. Higher magnification, however, brings out the star-like nucleus surrounded by a hazy halo. A triangle with three prominent stars can be seen immediately north-west of the galaxy.



NGC 1964 – Galaxy

About 2.5 degrees south-east of the galaxy is the prominent, colourful double star gamma Leporis. It is an easily split double star with a bright yellow-coloured primary and orange companion. This double star is a member of a larger stellar collection called the Ursa Major moving group, discovered in 1869 by English astronomer Richard Proctor. This group includes the well-known Big Dipper asterism.

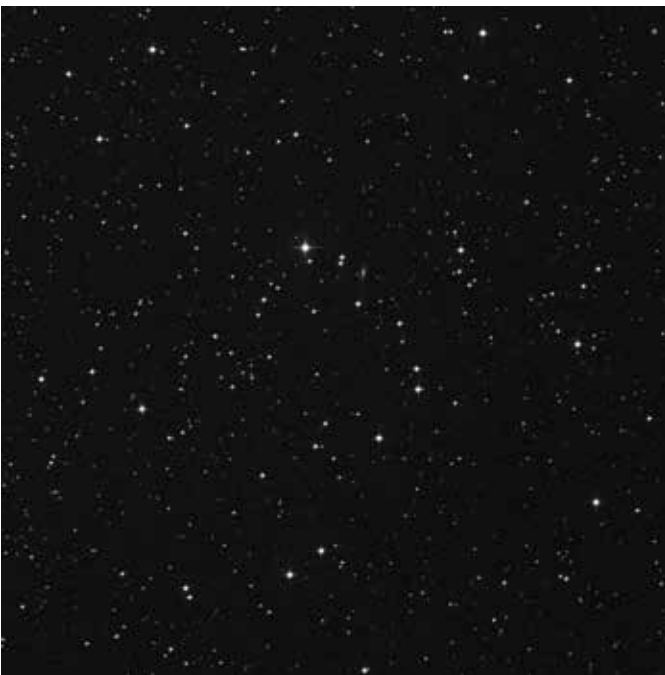
The grouping **ESO 489-SC01** is situated in the far south-eastern part of the constellation and consists of more or less a dozen varied-magnitude stars. The middle part of this grouping is highlighted by four stars in a square shape with fainter members intervening. The southern part of the group seems slightly busier in starlight. The brighter magnitude 10.4 star is situated towards the south-western end of the group.



NGC 1904 – Photograph: Hubble

Of course, our little rabbit constellation does not disappoint us. Among many other beautiful objects, it is also home to the exceptional globular cluster **NGC 1904**, also known as Messier 79, which is situated in the southern part of the constellation. The object brightens gradually towards the middle, which does not appear very dense. Numerous star strings on

the outskirts of the globular cluster extend like lace to give a refined appearance. With higher magnification the broad core appears to be surrounded by a soft hazy envelope. The southern edge of the globular cluster displays a somewhat lengthened appearance, possibly created by faint stars. With averted vision, faint stardust can be picked up covering the surface. A more prominent star string stands out towards the southern edge.

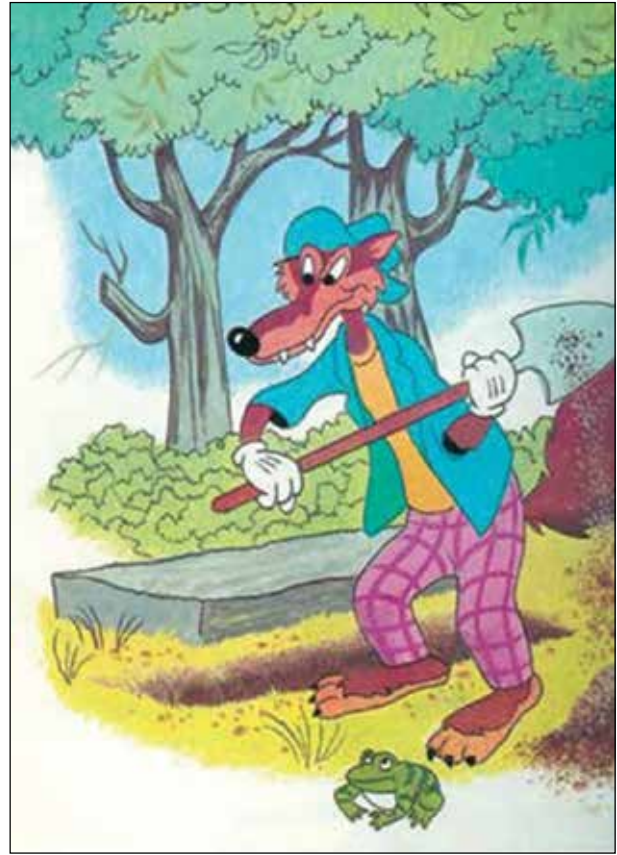
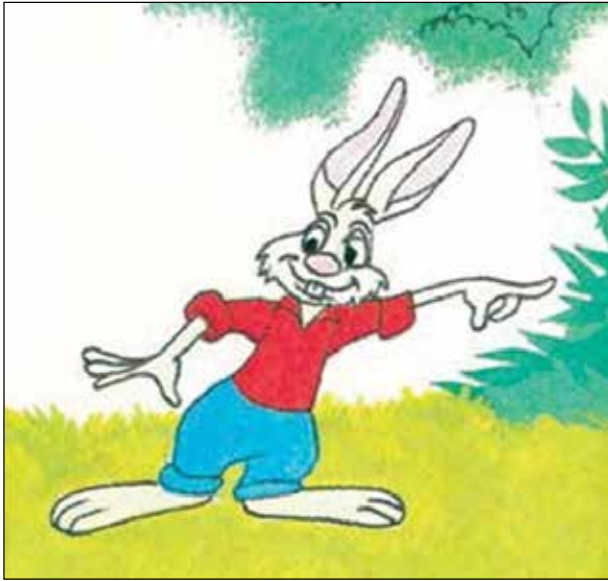


STREICHER 91 – Photograph: DSS

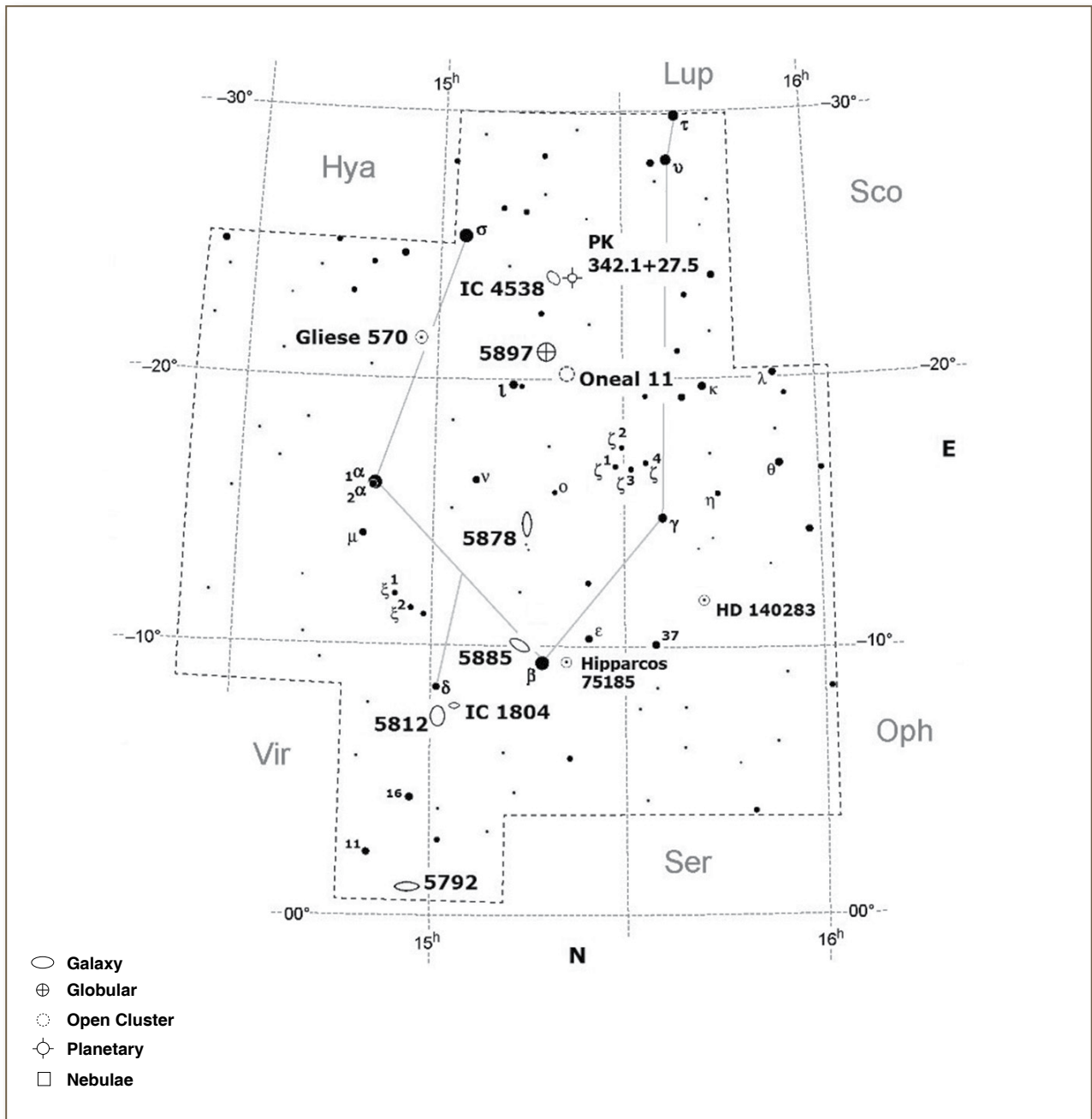
A mere one degree south of NGC 1904 a lovely half-moon of faint stars curves its way down to the south from the magnitude 8.4-star HD 35285 at the north-eastern tip. **STREICHER 91**, also known as the HD 35285-group of stars contains approximately a dozen colourful stars in various magnitudes. What was discovered afterwards is that a very faint galaxy forms part of this formation string of stars.

The galaxy **NGC 1744** displays itself only as a very soft, barely visible smear of light. This lenticular galaxy is very elongated in a north-south direction with just a slightly brighter nucleus surrounded by a soft halo. Two faint stars are superimposed on the dusty surface.

May a children's story like that of Farmer Rabbit and his friends live on just as the stars will keep on glittering in the night sky, providing star-lovers with endless pleasure and joy.



OBJECT	TYPE	RA	DEC	MAG	SIZE
R Leporis	Mira-type	04h59m.6	-14°48.0	5.5 11.7	Period 432 days
NGC 1744	Galaxy	05h00m.0	-26°01'.4	11.3	8.7'×5.1'
NGC 1832	Galaxy	05h12m.1	-15°41'.4	11.9	2.3'×1.5'
STREICHER 91 HD 35285-group	Asterism	05h22m.4	-25°40'.6	7	13'
NGC 1904 Messier 79	Globular Cluster	05h24m.5	-24°32'.0	7.7	9.6'
IC 418	Planetary Nebula	05h27m.5	-12°41'.8	10.7	20"
NGC 1964	Galaxy	05h33m.4	-21°56'.7	10.7	5'×2.1'
NGC 2017	Open Cluster	05h39m.4	-17°51'.0	7.5	4.5'
ADS 4260	Double Star	05h39m.7	-20°26'.0	6.9 7.9	Sep 11"
ESO 489-SC01	Open Cluster	06h05m.0	-20°44'.0	9.5	10'



The constellation of Libra

LIBRA

Balance your view through Libra

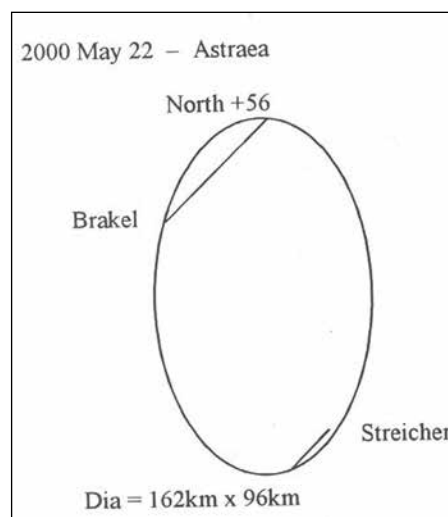
When the constellation Libra pops its scale up above the eastern horizon, it also brings the importance of balance to the fore. Balance has relevance to many things, not only for us as people, but also, and especially, to astronomy. Is our inclination not frequently to seek out only the bright deep sky objects, whether with a telescope, binoculars or the naked eye, while so many of the fainter objects are pushed aside? And this is where, when a balance is maintained, we can be surprised by the results.



Libra is located just north of the better-known constellation Scorpius. The stars currently making up the constellation were first characterised by Eratosthenes as the pinchers or claws of the Scorpius shape constellation.

About 4000 years ago the sun resided in Libra at the northern autumn equinox, when day and night have equal lengths and are in balance. Over time (due to the wobble of earth's axis under the gravity influence of the sun) its autumn equinox resides now in the constellation Virgo.

Virgo was a goddess known as Astraea who held the scales of Justice, which explains the association with the Scale indicated by the constellation Libra. Quite coincidentally, and aptly, on 22 May 2000 a message was received announcing the shadow track of an occultation of the magnitude 9.4-star Hipparcos 75185 by the minor planet (5) Astraea in the constellation of Libra. It was expected to cover Polokwane, the town in which I live, after crossing the Australian mainland and the Indian Ocean. The star is situated only a degree east of beta Librae. Albert Brakel and myself were advised by the RASNZ Occultation Section that



we had been successful in our observation of the occultation in defining the major dimension of (5) Astraea at 162km by 96km in size. The late Danie Overbeek (then the occultation director) was very excited and sent Brakel and me a note of appreciation (see occultation illustration – RASNZ).

The two famous stars alpha and beta Librae, probably have the strangest nicknames of all the stars in the sky: Zubenelgenubi, alpha (the southern claw), and even worse, Zebeneschamali, beta (the northern claw).

The magnitude 2.7 alpha is also a double star, shining with a pale-yellow primary and a light grey companion, with a separation of 60" and visible with the naked eye in very dark starry skies. The brighter beta Librae, with a magnitude of 2.5, is sometimes referred to as the pale emerald star.



PK 342.1+27.5 – Photograph: Dale Liebenberg

Searching for the planetary nebula **PK 342.1+27.5**, more popularly known as Me 2-1 is perhaps easier to locate the galaxy **IC 4538** in the far southern part of the constellation. No easy task, this galaxy is extremely faint, but averted vision will bring to the fore at least an oval haze. But when success is achieved, PK 342.1+27.5 is situated only 15' towards the east of the galaxy. The planetary, which is about 15 000 light-

years away, is also the close neighbour of the magnitude 9.8-star SAO 183407, only an arc-minute towards the west. The planetary nebula appears as a faint dot, barely seen, which disappears with direct vision, but averted vision shows an out-of-focus star with a soft edge. Perhaps a nebular filter would help one spot it and make the task slightly easier. If it had not been for the blinking effect, I would not easily have seen it. Higher magnification reveals a really soft, round planet Uranus impression with a light blue colour and smooth disc. The hot central magnitude 16 star could not be seen. Sometimes it requires careful observation and a lot of time and patience to spot special objects like this one. It was discovered by Paul Willard Merrill (1887–1961) in 1942. He was an American astronomer whose speciality was spectroscopy, and was the first to define Type-S stars in 1922. He spent the bulk of his career at Mount Wilson Observatory, from which he retired in 1952.

Approximately 1.5 degrees south of the double star iota Librae with a magnitude 4.5 and magnitude 6, one of the giant globular clusters found its home. The globular cluster **NGC 5897** displays a hazy, perhaps slightly oval glow with a fringed edge. NGC 5897 is not very condensed, gradually getting brighter towards the core. Careful observation reveals a sandpaper texture. It could also be seen as a loose heap of very faint stars mingling in haziness. With higher magnification, however, the very faint stars just seem to multiply, revealing a milky, blazing core blending together. The north-western edge comprises a few brighter stars, together with faint stars spreading out, which most probably gives it the slightly elongated impression.

Try to spot this globular cluster with binoculars when you next experience favourable dark skies. In April 1784, William Herschel was sweeping with his 18-inch speculum telescope and recorded this globular cluster as a compressed cluster of stars, 8' in size, extremely rich, of an irregular round figure a little extended. Further he adds that the stars are so small as to be hardly visible and so accumulated in the middle as to look nebulous.



NGC 5897 – Photograph: Dale Liebenberg

Gliese 570 is a multiple star system approximately 19 light-years from the sun towards the south-western part of the constellation. It consists of a 5.8 magnitude primary orange dwarf star (A) with a close binary magnitude 8.2 (B and C), two red dwarf stars orbiting A at a distance of 190 AU with a period of about 2130 years. The angular separation is 25.6" at a position angle (PA) of 305°. In 2000 a brown dwarf was found orbiting the system at a distance of more than 1500 AU and at the time it was the coolest brown dwarf yet discovered with a surface temperature of only 500° Celsius. The WDS lists other distant components D, E, F and G, which may be part of this system.

Asterisms are the beauties of the starry skies, just search them out. Not only is it fun but it will be more than rewarding; and on top credited by the Deep Sky Hunters forum if satisfied with the indicated criteria. Michael O'Neal, is one of the most active amateurs in the USA. **ONEAL 11**, is situated 2.7 degrees east of NGC 5897 and one of the faintest but truly specular star strings, daintily situated in an east-west direction. Seven varied-magnitude stars between 11 and 13 with a pair of magnitude 11.8 stars ended of the string towards the east end, one a pure white and the other a yellow colour.



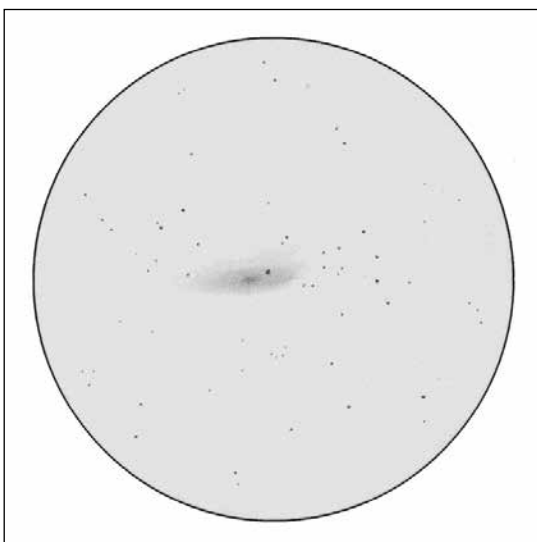
Michael O'Neal with his 16-inch Newtonian

NGC 5878 is an edge-on galaxy in the true sense, three times as long as it is wide and situated more or less halfway in line with alpha and the magnitude 3.9 gamma Librae. The galaxy is just south of two relatively bright stars and elongated in a north-south direction. The one thing outstanding is the small bright stellar nucleus. A nice V-shaped asterism is situated 30' towards the west of the galaxy.

A special galaxy, **NGC 5885**, is situated 2.6 degrees south-west of beta Librae. The galaxy is not very bright, but shines with a uniformly oval glow in a north-east to south-west direction. With really high power, very dark skies and patience a vague spiral structure can be glimpsed slightly towards the southern part. There is a slight brightening towards the inner north-eastern part of the galaxy which deep pictures show as a distorted arm. A magnitude 10 star plus a few faint companion stars pair together on the north-eastern rim. Large observatory telescopes show an inner ring.

Another lovely star in the constellation is gamma Librae, forming a long triangle north-east with alpha and beta Librae. This magnitude 4.9 eclipsing binary system consists of two stars orbiting each other every 2.3 days. The cooler, fainter one passes in front of the brighter companion, which experiences a 60 percent drop in brightness. It takes only an equal six hours to fall and rise in brightness and it is possible to trace this in one night of observation.

Only a degree north from delta Librae is a pair of galaxies quite different from each other. The brighter of the two, **NGC 5812**, is a typical elliptical galaxy, a fairly bright circular halo, well defined, with a stellar nucleus. The companion, **IC 1084**, is definitely a hide-away that is not easily seen. Real deep sky pictures, however, show a very small east-west spiral, a quarter the size of NGC 5812.



NGC 5792 – Galaxy

An introduction to another galaxy on the northern border with Virgo is **NGC 5792**, a typical barred spiral galaxy, slightly elongated in an east-west direction. A magnitude 9.5 red-orange star embedded towards the north-western part of the galaxy created a double nucleus. Although with averted vision, the galaxy is clearly separated from the star. On closer investigation the stellar nucleus appears to have a hazy envelope. Higher magnification and very dark skies reveal the northern edge slightly more defined with small dark knots on the surface. Try to avoid the star by ignoring it

and concentrating on the galaxy for faint detail.

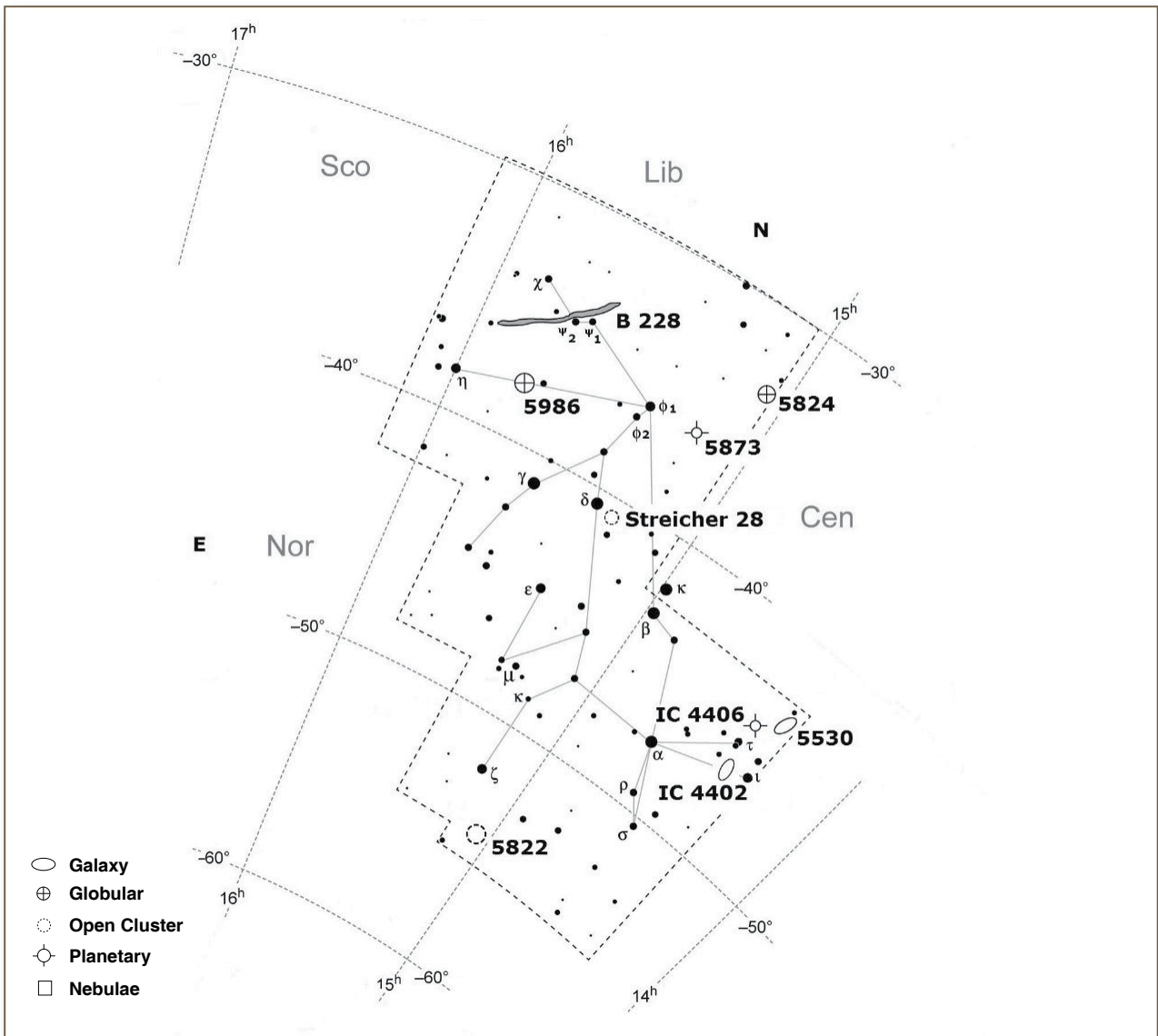
One of the oldest stars known in our Milky Way is HD 140283, a lovely buttery coloured magnitude 7.2 star only 190 light-years away from us. Find the star south-east of beta, 2 degrees from the star 37 Librae. According to a study it is low in heavy elements suggesting its age to be about 14.5 billion years old.

Balancing your life is not always easy, but do try weighing the objects of the less well-known constellations against those of the better-known ones and find a balance that will make observation worthwhile again and again.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Gliese 570 AB C D E F G	Multiple Star System	14h57m.5	-21°25'.0	5.8 8.2	Sep 25.6" PA 305°
NGC 5792	Galaxy	14h58m.4	-01°05'.0	11.2	7.3'×1.9'
NGC 5812	Galaxy	15h01m.0	-07°27'.1	11.2	2.3'×1.9'
IC 1084	Galaxy	15h01m.3	-07°28'.6	14.7	0.6'×0.4'
NGC 5878	Galaxy	15h13m.7	-14°16'.7	12	3.5'×1.4'
NGC 5885	Galaxy	15h15m.1	-10°05'.1	11.8	3.2'×2.6'
NGC 5897	Globular Cluster	15h17m.4	-21°00'.6	8.6	12.6'
IC 4538	Galaxy	15h21m.4	-23°39'.5	12.7	2.6'×2.0'
PK 342.1+27.5	Planetary Nebula	15h22m.3	-23°37'.5	11.6	6"
ONEAL 11	Asterism	15h28m.9	-20°21'.6	10	5'



Galaxies in Libra: NGC 5917 (top) and PGC 54817 –
Photograph: Dale Liebenberg



The constellation of Lupus



Brown Hyena – Photograph: Schalk Lourens *Aardwolf tot Ystervark*

LUPUS

A Wild Animal

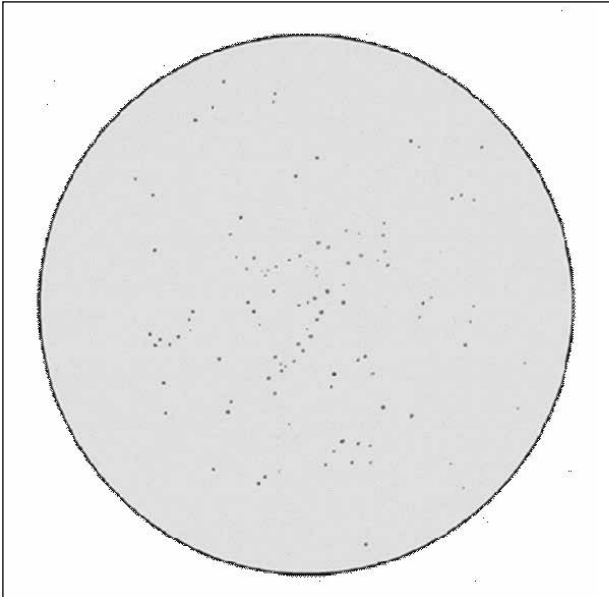
This is a story to tell. One weekend the Coopers came to visit me on the farm in the northern part of South Africa. For Tim it was literally heaven on earth under the dark night sky offering ideal circumstances to study meteors. My observatory is perched on the top of a building in an area consisting of mainly Mopani and Baobab trees that graciously drape the horizon. Ascending the steps, you are treated to a breathtaking view of the heavens.



That Saturday night Tim had settled down comfortably on a camp bed, busy plotting meteors. The evening was exceptionally quiet, very dark and cold. Suddenly, without warning, the most unearthly sound that I've ever heard in the bush veld echoed through the night. The horrific growls and howls got louder and nearer; nerve-wrecking is putting it mildly. Terrifying, with cold chills running down your back, is closer to the truth. Fortunately for me I was upstairs in my observatory, but poor Tim was down below in what might be ground zero! "What is that?" Tim enquired in a brave voice. "It sounds like a leopard catching a buck". To which I replied: "No, Timmy, it is much, much more dangerous!" Great was our relief when the wrestling match began to disappear into the distance. The altercation was between two brown Hyena's also sometimes referred to as wolves, wrestling over a bone or perhaps a four-legged lady.

The Greeks and Romans saw the constellation Lupus as the Wolf but for the Arabians (and Timmy!) it was their Leopard or Panther. This very ancient constellation known as Lupus is just east of Centaurus and south of Scorpius.

The star zeta Lupi in the southern part is a wide double star which boasts an orange, magnitude 3.4 primary and a magnitude 7 golden yellow companion. Sigma Lupii, by the looks of it hanging like a drop of water from what could be indicated as the starry wolf's tongue.



NGC 5822 – Open Cluster

Approximately 2.5 degrees further south brings us to our first deep sky object, **NGC 5822**, one of the most beautifully sprinkled open clusters. Short curved strings of stars intermingle with each other. It is open spaced and has faint members that run out to mingle well with the surrounding star field. The cluster resembles a distant town in the dark of night with its flickering streetlights, as seen from above. About a degree south-west is a small patch of faint stars, discovered by Auke Slotegraaf with his 11×80 tripod-mounted binoculars while sweeping the

Circinus/Lupus area. Auke's cluster, forms a close gathering of a few stars in a north-east to south-west direction.

The star alpha Lupi in the western part of the constellation was originally thought to be a triple system. The primary is a brilliant blue-white magnitude 2.3 star with a very faint magnitude 13.4 companion, separated by 27.3" at position angle (PA) 232°. The original third component is a field star, deep orange with a magnitude 6.8, situated to the north of the double star. Its contrasting colour with the blue-white coloured alpha Lupi nearby is an interesting sight.

Edge-on galaxies are some of my favorite objects to study. **IC 4402**, a lovely Type-Sb, which appears in a north-west to south-east direction, is just 23' east of iota Lupi close to the border with Centaurus. The galaxy that terminates in sharp pointed ends has a small relatively bright nucleus.

Right on the Centaurus border, 2.6 degrees north from iota Lupi, the spiral galaxy **NGC 5530** found a home. This galaxy appears as an oval haze with a very prominent bright star-like nucleus. The unusual brightness results from the near position of a magnitude 13 star. With higher magnification, a few faint stars can be seen on its dusty surface. John Herschel was very excited about this object when he described it as "perfectly sharp in the centre with a very dilute, gradually fading atmosphere". When it was photographed from Helwan Observatory, Egypt, in 1935 for the first time, it was identified as a spiral nebula.

As a bonus the planetary nebula **IC 4406** is just a degree south-east of NGC 5530. This planetary displays a hazy, boxy glow in an east-west direction with a fading northern axis. With even higher magnification, a pair of lobes can be seen tapering towards the middle area. This planetary is in the final stage of its life, resembling a doughnut shape from the side. Robert Innes rediscovered this planetary nebula with the 7-inch Metz refractor from the Cape of Good Hope on 14 August 1901, but it was already found in 1899 by DeLisle Stewart on an Arequipa plate.

Well-known to the northern hemisphere amateurs and situated in the constellation Camelopardalis, is the asterism Kemble Cascade. In the central region of the starry wolf constellation, I came across a similar group impression. **STREICHER 28** also resembles a cascade but on a much smaller and fainter scale and is situated 30' south-west of delta Lupi. The brightest star in this group is magnitude 8.6, with fainter stars in a downward string running for almost 10' in a north-west to south-east direction.



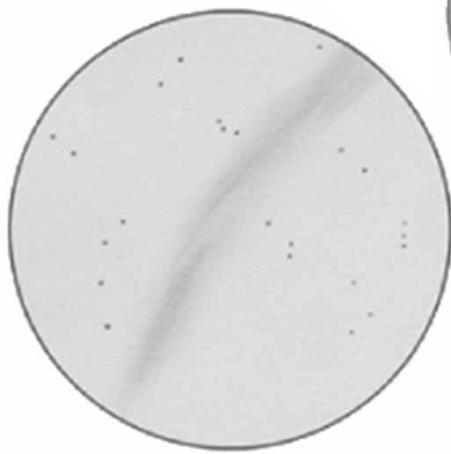
STREICHER 28 – Photograph: DSS

Little did I know at the time when I admired this asterism that the ancient 1006 supernova is situated only 3 degrees towards the west. Not that there is anything to see! On 1 May 1006 AD a spectacularly bright star appeared suddenly in this constellation, visible for several months before becoming lost in the glare of daylight. Observers in China, Japan, Egypt, Iraq, Italy and Switzerland recorded observations of this strange star. The remains of that supernova are all but invisible today, however, studies show the exploded star to be around 7000 light-years distant and are believed to be a Type-Ia supernova.

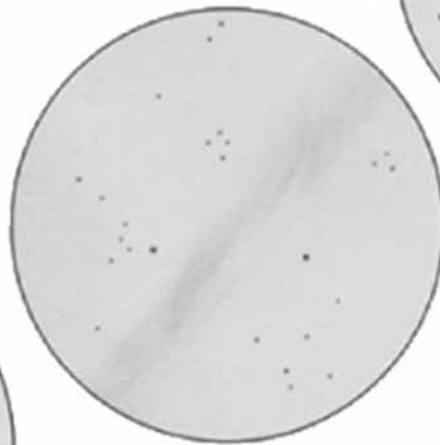
The planetary nebula **NGC 5873** is situated 2.4 degrees south-west of the double star phi Lupi. It is arranged in a perfect triangle with two magnitude 11.5 field stars. This small planetary nebula, almost 16 000 light-years away, appears stellar and slightly out of focus. With averted vision, it displays a light frosted blue-grey colour. NGC 5873 was the first deep-sky object found from South America. Ralph Copeland saw the planetary nebula by visual spectroscopy in 1883 at Lake Titicaca, Peru.

In the far northern corner of the constellation, on the border with Centaurus, the globular cluster **NGC 5824**, also known as Bennett 67, can be found. Easy visible, this object reminds me of a streetlight on a rainy and misty night. Small in size and relatively bright, it grows gradually brighter to a nearly star-like core. It displays a hazy envelope changing into a flimsy outward haze. Even with high magnification, no stars are resolved, although the edges become faintly granular. It was missed by John Herschel and picked up by Edward Emerson Barnard who described it as a nebula with a stellar nucleus. NGC 5824 was discovered by James Dunlop in 1826.

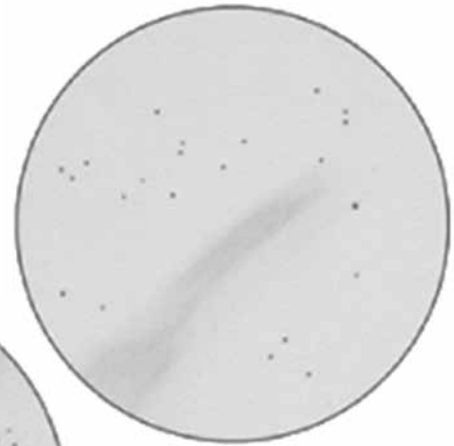
Fortunately, the constellation Lupus houses the dark nebula **BARNARD 228** situated just north-east from psi Lupii. It appears as a long, dark ink-stain in a north-west to south-east direction without any obvious starlight. This long streak of dark nebulosity is more than 5 degrees in length. The north-western part of the nebula looks wider with the conveniently magnitude 7.6 star, HD 143098 show the way.



SE part of B228
Dark Nebula



Middle part of B228
Dark Nebula

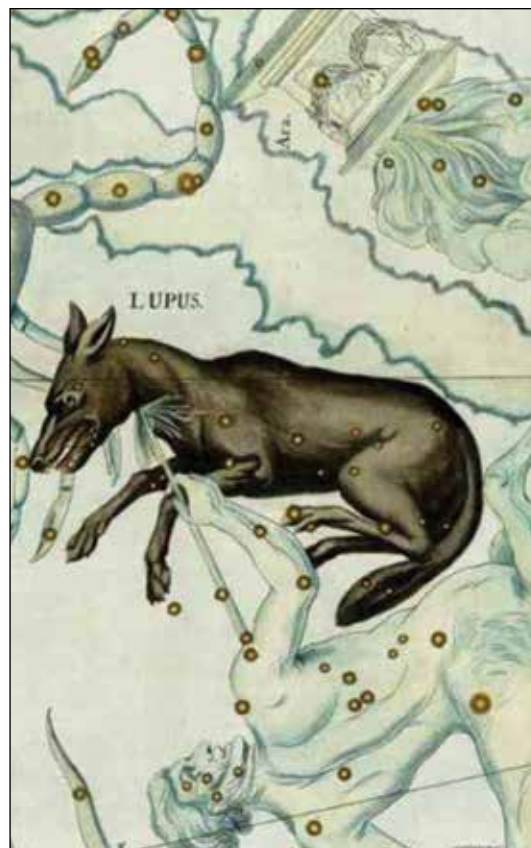


NW part of B228
Dark Nebula

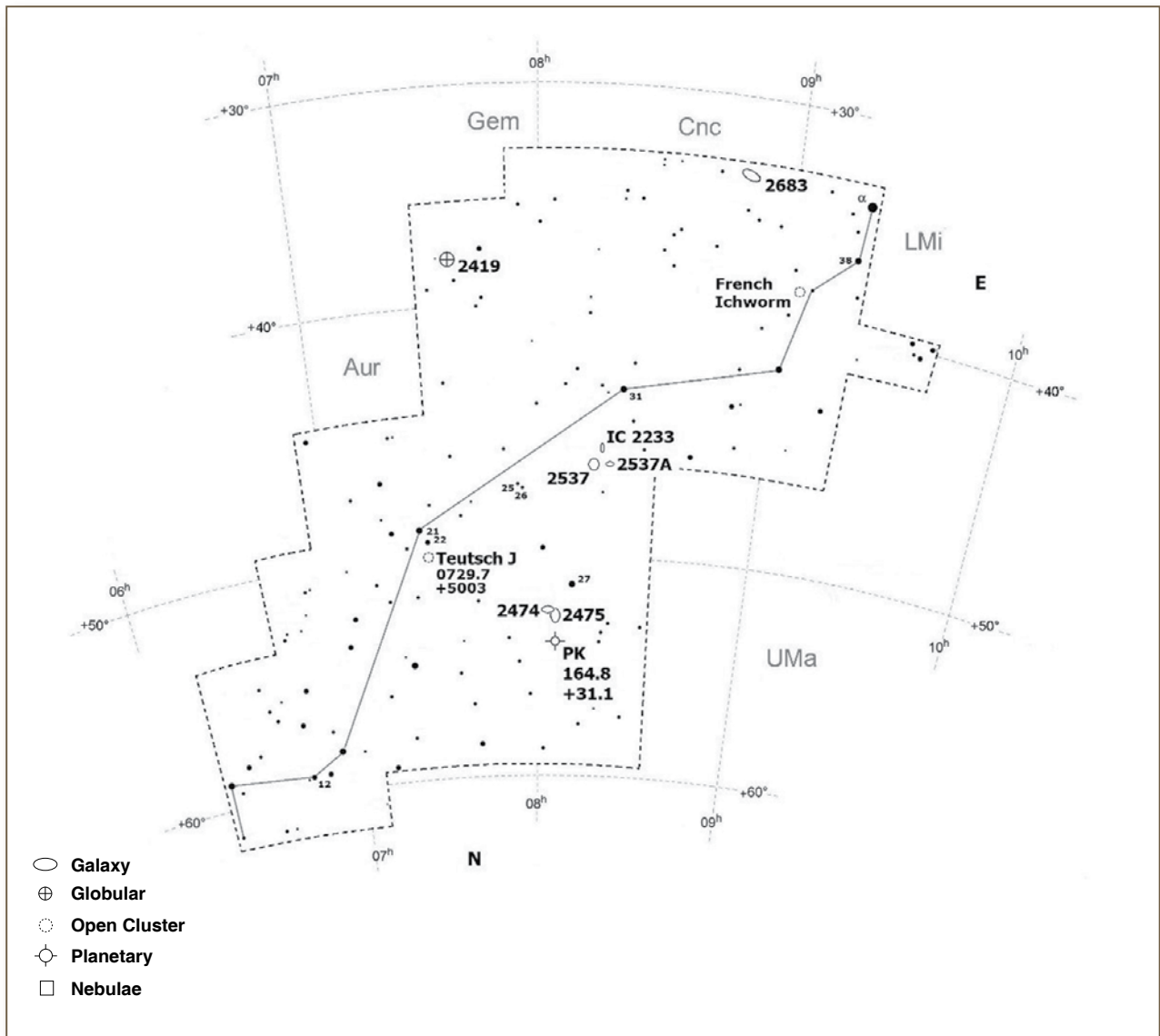
Continue a few degrees south to reach the globular cluster **NGC 5986**, also known as Bennett 70. It is a beautiful bright, relatively large object, standing out well against the background star field. It displays a moderate concentration of stars with a soft envelope around its bright core. Stars are well resolved towards the edges. The globular cluster is slightly elongated in a north-west to south-east direction and about 35 000 light-years away. A lovely magnitude 6 star can be seen 18' towards the south-eastern star field. NGC 5986 was also discovered by James Dunlop in May 1826. Auke Slotegraaf wonders why there are such widely differing sizes given for this globular in various catalogues, varying between 2' and 10'.

I braved the dark of the African bush with my telescope to enjoy and appreciate the wonderful southern deep sky treasures. The "wolves" who invaded the campsite are long gone but they certainly made the evening spent in the Lupus constellation very memorable!

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5530	Galaxy	14h18m.5	-43°24'.0	11.1	4.9'×2.2'
IC 4402	Galaxy	14h21m.2	-46°17'.8	12	4.2'×1'
IC 4406	Planetary Nebula	14h22m.4	-44°09'.0	10.2	28"
NGC 5824	Globular Cluster	15h04m.0	-33°04'.0	7.8	6.2'
NGC 5822	Open Cluster	15h05m.2	-54°21'.0	6.5	39'
NGC 5873	Planetary Nebula	15h12m.8	-38°08'.0	11	3"
STREICHER 28 DSH J1519.0-4055	Asterism	15h19m.0	-40°55'.7	10.5	16'
BARNARD 228	Dark Nebula	15h45m.5	-34°24'.0	–	5°
NGC 5986	Globular Cluster	15h46m.1	-37°47'.0	7.5	9.8'



Photograph: Astronomytrek

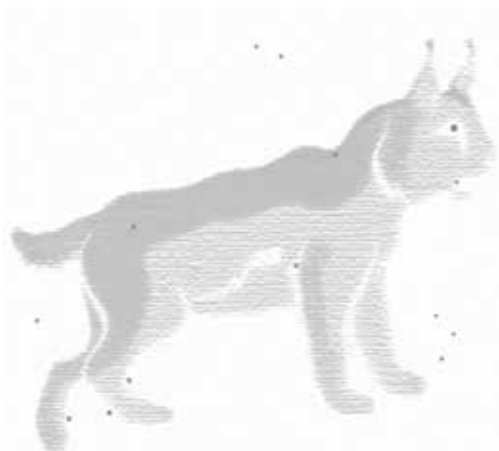


The constellation of Lynx

LYNX

A Tiger with Deep Sky Spots

The constellation Lynx, so named by Hevelius, consists mainly of faint stars situated between the constellations Auriga and Ursa Major. One's first thought would be: can this constellation offer the observer any worthwhile deep-sky objects? And the answer is: yes, it can! Lynx has perhaps some of the most beautiful double stars, a large number of galaxies, and a few interesting asterisms to offer.



The eye of this special cat, alpha Lyncis, a red star, is close to the border with Leo Minor, perhaps looking for a catch ... who knows what the ancient astronomers were thinking at the time? Close to the northern border with Cancer is a group of galaxies sharing the border between the two constellations. **NGC 2683** is a beautiful edge-on galaxy relatively bright with a magnitude of 9.8 and better known by some by its nickname, the UFO galaxy. It appears to be in a north-east to south-west direction with a long bright core extending nearly 2.5' along the length of the galaxy, working its way to a small outstanding nucleus. With care a hazy halo can be glimpsed that gives the impression of floating away in the distance, just like a UFO. A few bright stars are situated on the southern edge, and towards the west a magnitude 11 double star and a magnitude 6 star round off the field of view.

Going down the spotted neckline of the tiger, astronomy friend Sue French nicknamed a lovely group of stars **FRENCH Inchworm** nearly 5 degrees north-west of alpha Lyncis. The asterism contains a handful of stars in a long slender shape, pretty and outstanding against the star field with the star HD 77912 the brightest.

The constellation houses plenty of galaxies, but also adding to its fame is the globular cluster **NGC 2419** situated in the western part of the constellation 1.5 degrees to the border with Auriga. Sadly, this globular, which is around 300 000 light-years away, shows only a dim, faint glow with a condensed middle. It shares the field of view in line towards the east end with two magnitude 7 stars. It is called (quite appropriately) the inter-galactic wanderer, because of its remoteness towards the outskirts of our galaxy. As this deep-sky object's light shines through the eyepiece of a telescope, it brings home to one something more of a perspective of infinity, which the mind is unable fully to grasp.



NGC 2537A and NGC 2537 – Photograph: Megan Smith

The galaxy **NGC 2537** and two other members, **NGC 2537A** and **IC 2233**, are situated halfway between stars 31 and the double star 25/26 Lyncis. NGC 2537 is an open spiral, commonly also known as the Bear Paw Galaxy. This galaxy displays a roundish figure with a few outstanding brighter knots on its surface that fit the description of a bear's paw in a realistic way. A few arc-minutes east, NGC 2437A is barely visible (see photograph). The very faint edge-on galaxy IC 2233, is situated further south in the field of view.

The asterism **TEUTSCH J0729.7+5003** is barely 15' north from 22 Lyncis. The grouping consists of five lovely yellow-coloured magnitude 8 stars in a halfmoon with a few fainter members in between.

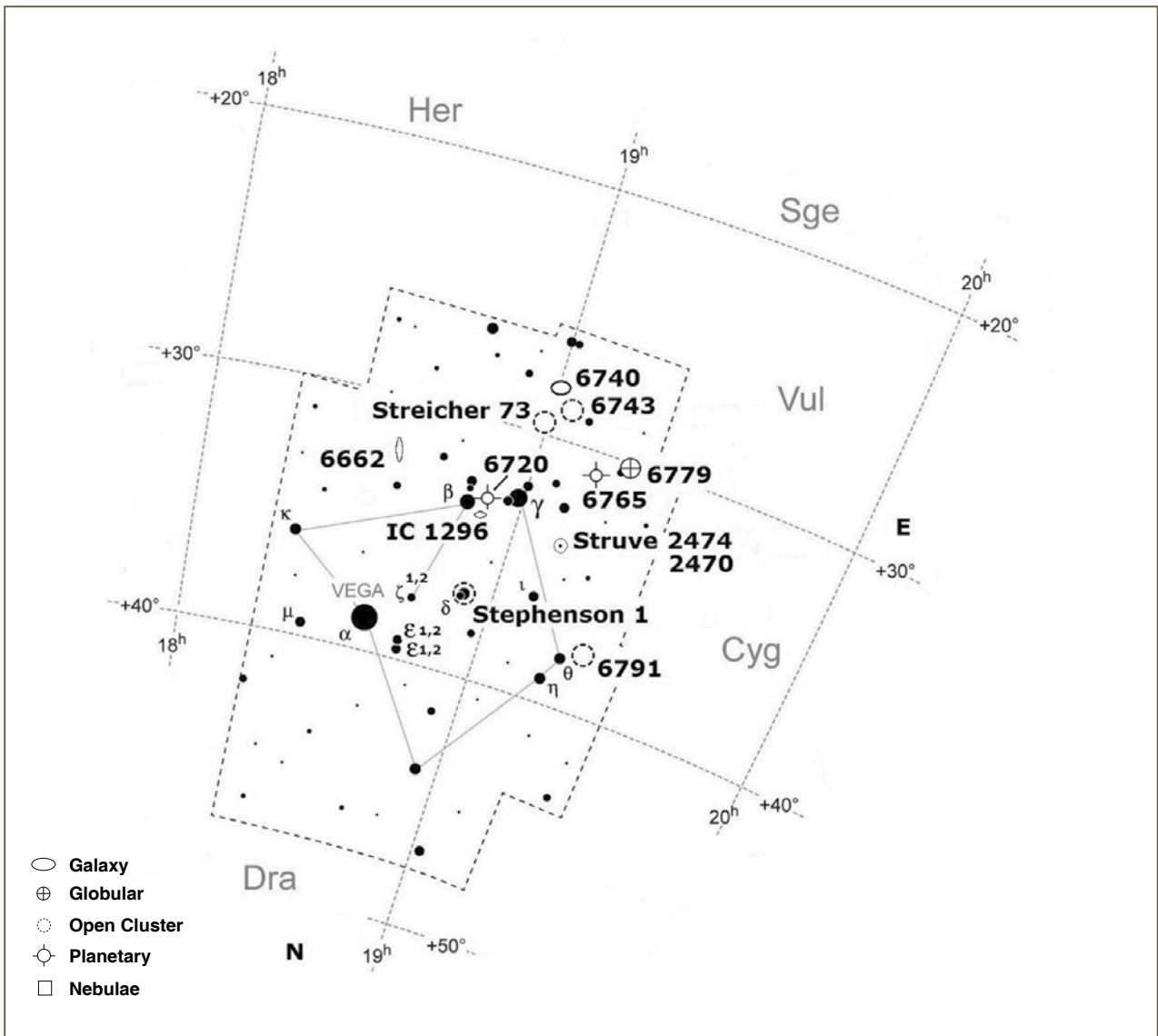
Two striking galaxies, **NGC 2474** and **NGC 2475** are situated 2.5 degrees north-west of the star 27 Lyncis. They are a look-a-like hazy roundish pair in close contact with each other, both displaying prominent cores. Because of their faintness they are not easy to observe.

Half a degree further north the planetary nebula **PK 164.8+31.1** can be glimpsed, but only in truly dark skies, with a relatively large telescope and with a lot of good luck. The planetary is large, with a very low surface brightness, and O-III or UHC filters could be of great help. It contains two outstanding arcs of light which together have become known as the Headphone Nebula or Ear Muffs Nebula. The planetary nebula was discovered by Rebecca Jones and Richard Emberson and is known as Jones-Emberson 1.

A beautiful double star, 12 Lyncis, gives the impression of hanging on for dear life at the tail end of this starry tiger. It consists of a double star, magnitude 5.3 and a magnitude 5.9, both displaying a yellow-white colour with a separation of 1.7" and a (PA) of 70°.

The heavenly tiger deserves its place among the northern stars, an outstanding animal on earth, but also outstanding in the form of a constellation with lovely objects on its spotted jacket.

OBJECT	TYPE	RA	DEC	MAG	SIZE
TEUTSCH J0729.7+5003	Asterism	07h29m.7	+50°03'.0	8.5	13'
NGC 2419	Globular Cluster	07h38m.1	+38°53'.3	10.4	4'
PK 164.8+31.1	Planetary Nebula	07h57m.9	+53°25'.8	12.2	380"
NGC 2474	Galaxy	07h57m.9	+52°51'.3	13.1	0.6'×0.6'
NGC 2475	Galaxy	07h58m.1	+52°51'.8	13	0.8'×0.8'
NGC 2537	Galaxy	08h13m.2	+45°59'.8	11.7	1.6'×1.4'
NGC 2537A	Galaxy	08h13m.7	+46°00'.4	14.8	0.5'×0.5'
IC 2233	Galaxy	08h14m.9	+45°44'.3	12.6	4.3'×0.6'
NGC 2683	Galaxy	08h52m.7	+33°25'.5	9.8	8.4'×2.4'
FRENCH Inchworm	Asterism	09h05m.9	+38°11'.8	7	35'



The constellation of Lyra



LYRA

Rings Around Lyra

The southern hemisphere winter months occasionally deliver wonderfully clear nights, ideal for visiting the area around the constellation Lyra and the famous Ring Nebula. Yes, I know it is fairly far north, but allow me the opportunity to show you around. The shape of this small but interesting constellation does, in a fact, resemble a harp.

Legend has it that Orpheus was able to bring forth the most beautiful melodies on the harp, earning him a place of honour amongst the stars. The Arabs refer to the constellation as the Phoenician Harp, while other cultures knew it as the Swooping Eagle or the Goose (*Star Names: Their Lore and Meaning* – Richard Allen).

The crown of the harp houses the brilliant blue-white magnitude 0.03 alpha Lyrae (Vega), the fifth brightest star in the sky. Thousands of years ago, Vega was the north-pole star, which it will be again in another 12 000 years from now. Vega is only 25 light-years distant and larger than our Sun. It appears that this famous star has a clumpy ring of cold dust around it that may reveal hidden planets. The knots of clumps in the dust are offset around 60 and 70 astronomical units from Vega.

This constellation becomes briefly active each April as the earth passes through the debris stream of comet C/1861 G1 Thatcher. It is like singing along with Perry Como to “Catch a falling star”. The peak activity is quite sharp, usually centred on the night of April 21/22 when about 15 medium speed meteors can be observed emanating near Vega each hour. In 1982 this shower surprised observers with several times this rate. No such outbursts have been seen since, but who knows when it will appear again (*Tim Cooper*).

Photograph: Capcana



Double stars are well represented in Lyra. Certainly, one of the best-known double-double stars is epsilon Lyrae, approximately 1.5 degrees north-east of Vega. The separation is 207.7" and is the traditional test for visual acuteness to split without optical aid under ideal dark sky conditions. However, medium to high magnification is needed to separate each of its companions, which, in turn, are doubles in themselves. The magnitude 5 epsilon1 Lyrae (the northern double of the pair) has a magnitude 6.1 companion with a separation of 3.1", oriented north-south. The magnitude 5.2 epsilon2 Lyrae (the southern double) has a magnitude 5.5 companion, with a separation of 2.3" arranged east-west.

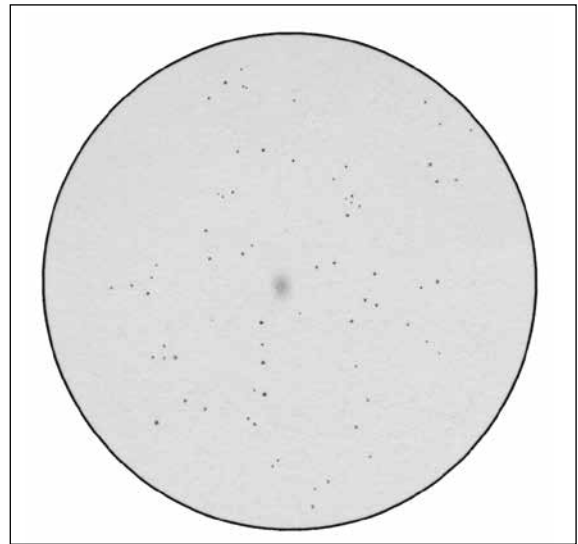
Double star delta Lyrae forms a long triangle with double stars epsilon and zeta Lyrae. The south-eastern magnitude 4.5 delta2 Lyrae is magnified by its deep orange colour, a contrast to the somewhat cream-white magnitude 5.6 delta1 Lyrae, which is situated to the north-west.

The open star cluster **STEPHENSON 1** cunningly spreads its handful of stars intimately between the double star delta Lyrae and further southwards to form a V-grouping of approximately 20' in size. As we are in the music constellation, this object reminds me to one of Jim Reeves' songs, "When two worlds collide" which became well-known back in 1960. Music is food for the soul and provides a wonderful shield against a chilly night under the stars.

I'm running rings around Lyra in search of a relatively bright galaxy to share with you. Not that there is a shortage of galaxies in this constellation, but they are all rather faint. **NGC 6662** is situated in the far south-western starry field of the constellation. The galaxy displays a faint north-south ghost needle and can be glimpsed only with averted vision. By looking slightly away from a faint object through a telescope, its light falls onto the edge of the retina where it is picked up by the sensitive rod cells.

The globular cluster **NGC 6779**, also known as Messier 56, unfolds as a flimsy haziness against the star field, and is situated about 4 degrees south-east from gamma Lyrae. Higher magnification shows star points sprinkled over a tight broad core and reminds me somewhat of a delicate brooch. Closer investigation reveals a handful of yellow to red-coloured stars. The members spread out west and are slightly deprived of starlight towards the east. I cannot but agree more with Pat Boone's song, "There is a goldmine in the sky".

A degree west of M56, the planetary nebula **NGC 6765** can be found. High magnification is needed, and a filter or two will help to define its appearance. The planetary is slightly elongated and faint but apart from that it is outstanding against the background star field. Closer investigation displays a brighter centre, with a small outer envelope and light grey in colour.



NGC 6765 – Planetary Nebula

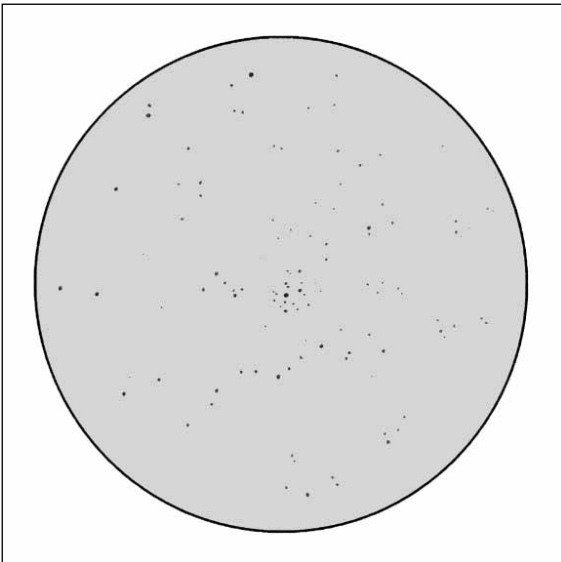
Three objects can be seen in only a degree field of view towards the southern part of the constellation. **STREICHER 73** has a lot to offer to keep the mind thinking. The asterism reminds me of the “Mopani worm” typically found in the northern bushveld. Two magnitude 10 stars form a double to the north-west of the group, with fainter members stringing along to the south-east. Although it is a busy star field, the grouping stands out well.



STREICHER 73 – Picture Credit: DSS



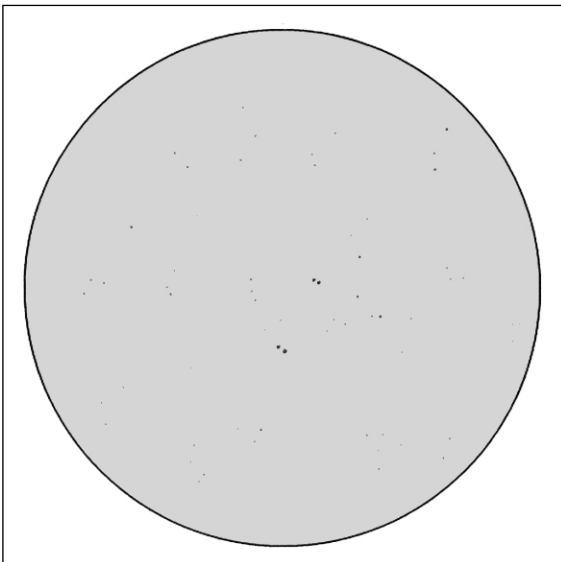
The Mopani worm
found in the northern
parts of South Africa



NGC 6743 – Open Cluster

Barely 30' further south the open cluster **NGC 6743** displays a petite grouping, relatively round in shape and exhibiting about a dozen white glittering stars. The main focus of the cluster is a bar of stars running from north to south containing the brighter magnitude 8.4-star HD 176970, a wonderful object to sketch.

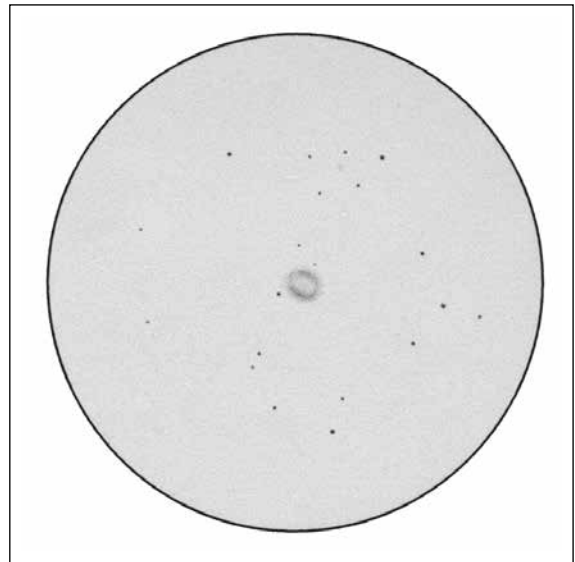
To conclude the trio of objects, the galaxy **NGC 6740** is situated barely 10' south of NGC 6743. This galaxy is not at all easy to glimpse, very faint and displays only a faint roundish glow with a star-point nucleus.

STRUVE 2470 and 2474
Double Stars

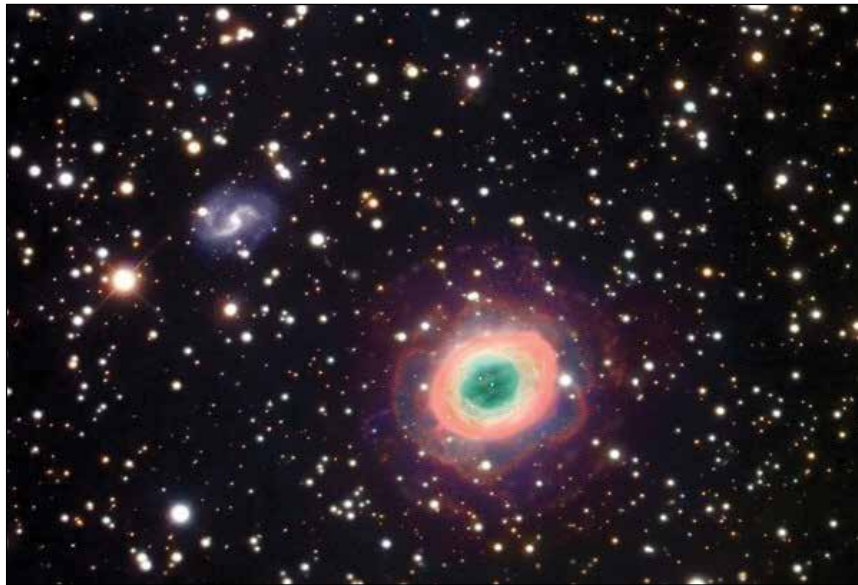
Lyra sports not only one famous double-double star, but also another less known double-double situated about 2.5 degrees north-east of gamma Lyrae. Known as STRUVE 2470 and 2474, they orientate uniquely in the same east-west direction, more or less the same brightness and only 10' apart. The northern grouping (Struve 2470) with a separation of 13.4", displays a cream-white magnitude 6.6 primary and a magnitude 8.6 companion with a unique aqua colour. The southern double (Struve 2474) contrasts beautifully in colour with a rich yellow magnitude 6.7 primary and magnitude 8.8 dirty yellow-white companion with a separation of 16.2".

Friedrich Georg Wilhelm Struve discovered this double star in the early 19th century. He was born in Germany on 15 April 1793 and died at the Pulkovo observatory in Russia on 23 November 1864. He studied multiple stars at the Dorpat Observatory in Estonia (*Astronomy* – Michael Hoskin).

Probably one of the best-known objects is **NGC 6720**, also known as Messier 57, or even better as the Ring Nebula – Lyra’s precious jewel on display in its show-case. This well-known nebula is outstandingly bright in a round to oval shape. The smoke ring contrasts well against the darker inner halo. Conversely, the north-west and south-east parts of the nebula are better defined, with a slight brightening in the south easterly section. The planetary nebula appears grey in colour and has a magnitude 12 star on its eastern border. The very faint elusive galaxy **IC 1296** is situated only 4.4’ north-west of the planetary nebula.



NGC 6720 – Planetary Nebula



NGC 6720 – M57 – Photograph: Adam Block, Caelum Observatory and Mount Lemmon Sky Centre, University of Arizona: (Board of Regents)



NGC 6791 – Photograph: Rogerivester

NGC 6791 is one of the few open clusters estimated to be older than 6 billion years and ties with Melotte 66 as one of the oldest listed. NGC 6791 is situated a degree south-east of magnitude 4.3 theta Lyrae. The cluster displays a soft roundish patch of light and with higher magnification a multitude of faint stars come to light. The group mingles well with a very busy star field.

What is interesting is that the Kepler Space Craft searched for other worlds in a 100 square degrees field in the constellations of Lyra, Cygnus and Draco, allowing the spacecraft to stare at nearly 170 000 stars over its 3.5-year lifetime.

It is customary for many amateurs to listen to music while observing. Most of the time I prefer silence; with only the stars for company. When I have the urge to listen to music, I prefer the golden oldies of yesteryear. The harp-shaped constellation engenders a touch of nostalgia, so that my preferred favourite then is Dean Martin's song of way back, "Baby its cold outside".

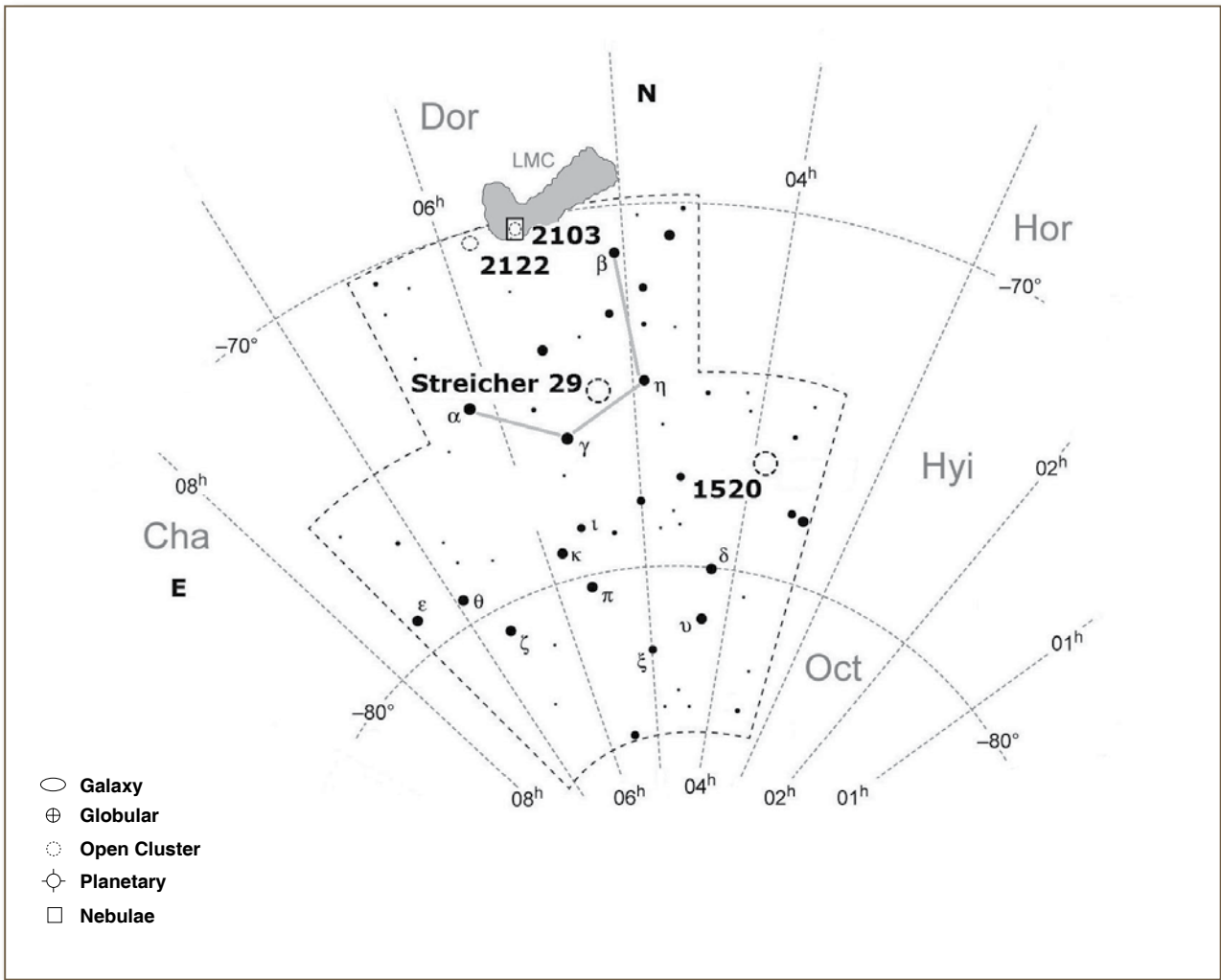
I wonder what kind of music inspires your heart and makes you instinctively want to bond effortlessly with the dark starry sky filled with deep-sky promises as I listen to Louis Armstrong's "What a wonderful world".



OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6662	Galaxy	18h34m.0	+32°03'.0	13.5	1.7'×0.5'
IC 1296	Galaxy	18h53m.3	+33°03'.8	14.8	1.1'×0.8'
NGC 6720 Messier 57	Planetary Nebula	18h53m.6	+33°02'.0	8.8	71"
STEPHENSON 1	Open Cluster	18h54m.5	+36°53'.8	3.8	40'
STREICHER 73 SAO 86667-group	Asterism	18h59m.3	+29°45.2	10	4'
NGC 6740	Galaxy	19h00m.8	+28°45'.0	13	0.9'×0.8'
NGC 6743	Open Cluster	19h01m.2	+29°17'.0	8.2	8'
STRUVE 2470	Double star	19h08m.8	+34°46'.0	6.6-8.6	13.4"
STRUVE 2474	Double star	19h09m.1	+34°36'.0	6.7-8.8	16.2"
NGC 6765	Planetary Nebula	19h11m.1	+30°32'.8	12.5	38"
NGC 6779 Messier 56	Globular Cluster	19h16m.6	+30°11'.0	8.3	7.1'
NGC 6791	Open Cluster	19h20m.7	+37°51'.0	9.5	15'



The Uranometria card of 1603 with Lyra to the right



The constellation of Mensa



Table Mountain South Africa – Photograph: Andra Swart le Roux

MENSA

Mensa the Mountain

The great astronomer Nicolas Louis de Lacaille formed the figure Mensa from stars situated close to the Large Magellanic Cloud, and just south of the polar constellation Octans. The constellation is honoured by Lacaille as our own Table Mountain at the Cape of Good Hope.



The open clusters in Mensa can be described only as faint hazy dots, seeing that it is part of our distant satellite galaxy and relatively far away to gasp through ordinary telescopes. However, **NGC 2122** displays a small roundish drop of moist with fading edges. With careful observation the south-western part seems slightly more defined with a peppery impression. The cluster is situated on the southern edge of the LMC, a field of view that is filled with faint stars and nebulosity.

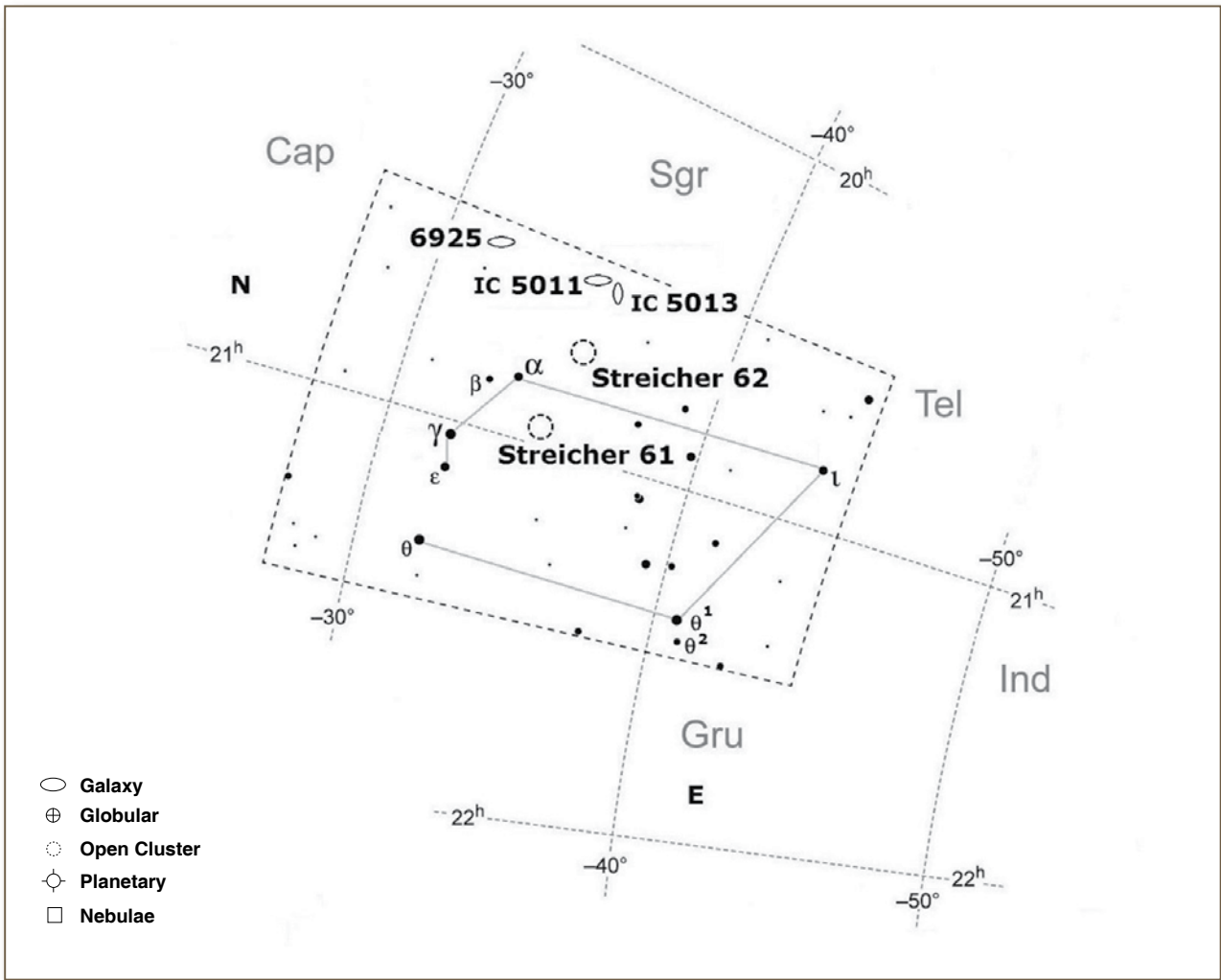
The emission nebula **NGC 2103**, 1.5 degrees further south from NGC 2122, reveals a barely seen misty piece of nebulosity slightly oval in shape. Higher magnification brings to the fore a few faint stars embedded in the hazy, uneven surface.

STREICHER 29 is a rather faint group of stars that displays the letter G in an amazingly realistic representation. Most of the stars are of a similar magnitude in the midst of a busy star field. The globular cluster IC 2134 is situated towards the southern end of the group.

A slightly brighter open cluster **NGC 1520** displays a few stars of approximately magnitude 9 in brightness that appear close together as a group. A triangle of stars occupies the centre with some fainter members stringing towards the north. Although it clearly stands out against the hazy field of view the area is scattered in faint starlight.

In the night shadow of Lacailles' great mountain I spend hours of solitude, searching for these small whispers of faint light, knowing that my love of astronomy is timeless.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1520	Open Cluster	03h57m.5	-76°50'.2	9	5'
STREICHER 29 DSH J0517.5-7507	Asterism	05h17m.5	-75°07'.0	8	14'
NGC 2103	Nebula	05h41m.7	-71°20'.1	11	3'
NGC 2122	Open Cluster	05h48m.8	-70°04'.2	10	4'



The constellation of Microscopium



Primitive microscope invented by Galileo Galilei
 Photograph: Belinda Streicher le Roux

MICROSCOPIUM

The Instrument

The shape of the stars in the constellation Microscopium was formed by Nicolas Louis de Lacaille, situated south of Capricornus and west of Piscis Austrinus, although small and unimportant it still contains sixty-nine stars varying in magnitude from 4.8 to 7.



The two galaxies **IC 5011** and **IC 5013** are situated virtually on top of each other, with the northern IC 5011 member in a north-south direction. IC 5013 appears as a slightly smaller smear of light in an east-west direction. Towards the north-west the star field seems very busy, with a magnitude 7.8 star in the southern field of view.

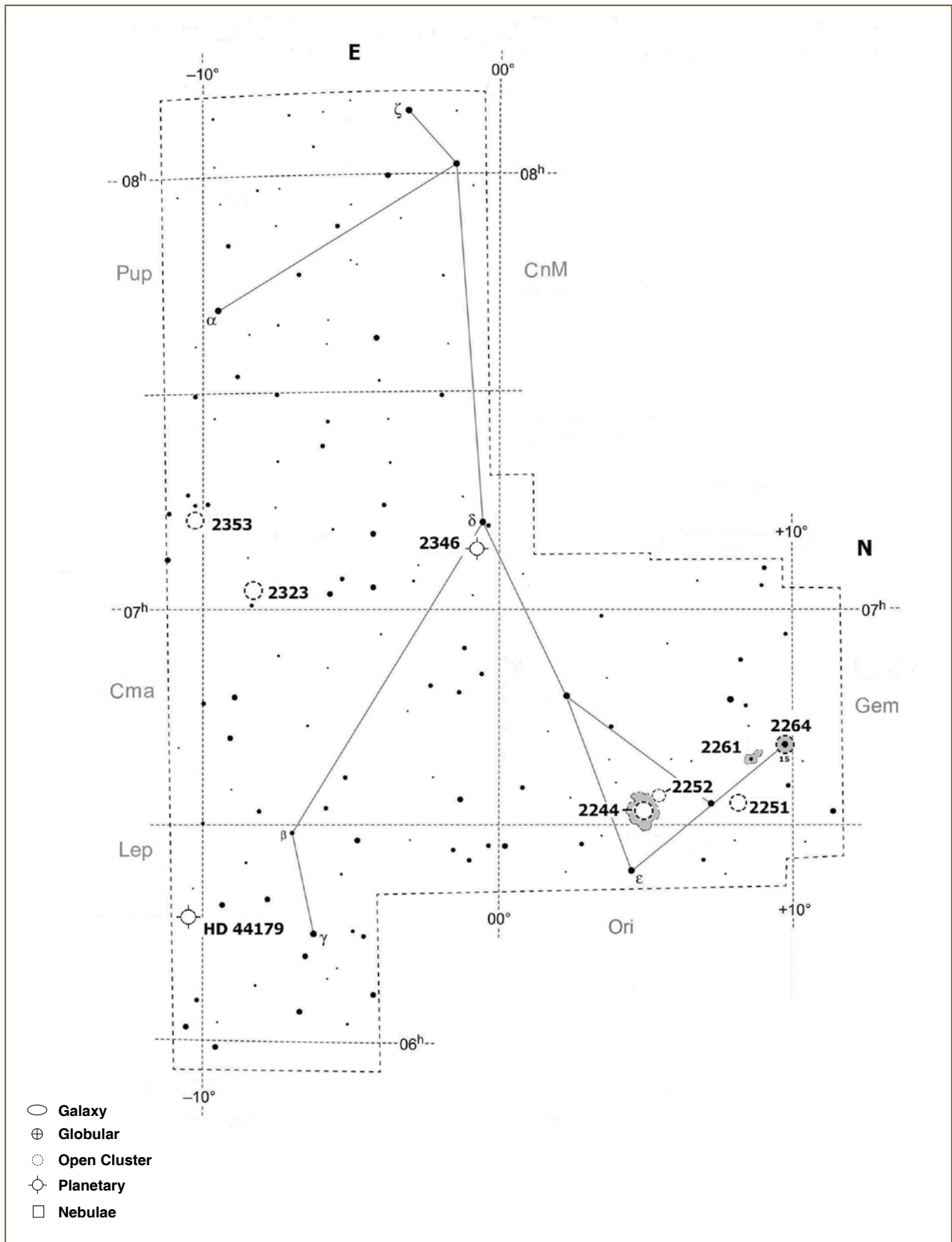
NGC 6925 is a very elongated galaxy in a north-south direction and relatively easy seen in the far western part of the constellation. The southern end is slightly thicker and hazier than the more point-like northern section. The nucleus grows slowly brighter to a very sharp point of light. Three field stars also located north-south can be seen toward the west in the field of view. The middle star appears double.

STREICHER 62 is a lovely grouping elongated in a north-south direction and perhaps displays a sort of W shape. The bright variable star BX Microscopii is situated towards the north of the grouping.

The asterism **STREICHER 61** is a relatively outstanding grouping of various magnitude stars in a north-west to south-east direction. The brightest star in the asterism is HD 199672, which shines with a magnitude of 8.6. It resembles also a mini-Gemini constellation in shape.

An instrument of sorts can create a window for us earthlings to delve deep into a wonderful world of the unknown.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5011	Galaxy	20h28m.6	-36°01'.8	12.7	2.4'×1.3'
NGC 5013	Galaxy	20h29m.5	-36°02'.5	14.6	0.7'×0.6'
NGC 6925	Galaxy	20h34m.3	-31°59'.2	12	4.4'×1.1'
STREICHER 62 DSH J2045.3-3517	Asterism	20h45m.3	-35°17'.0	9	18'
STREICHER 61 DSH J2059.1-3446	Asterism	20h59m.1	-34°46'.0	7	21'

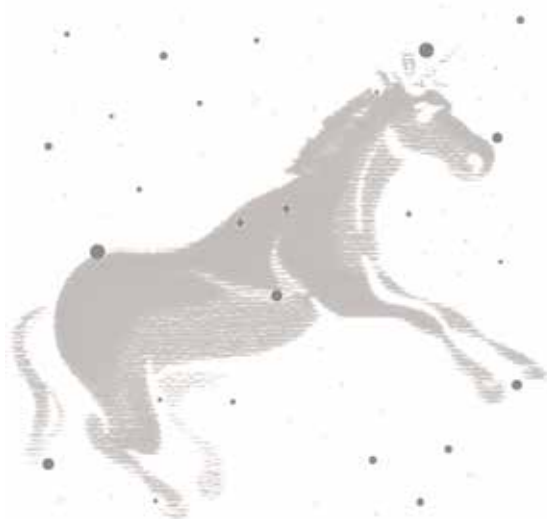


The constellation of Monoceros

MONOCEROS

Mythical Monoceros, the Unicorn of the Skies

On the north-eastern slopes of the well-known Orion constellation the Monoceros Unicorn gallops on in the direction of Gemini the twins. The constellation lacks stars brighter than magnitude 4, but is blessed with beautiful nebulae and star clusters. Various myths surround the reflection of the image, one of which is the misinterpretation of what we know today as the rhinoceros.



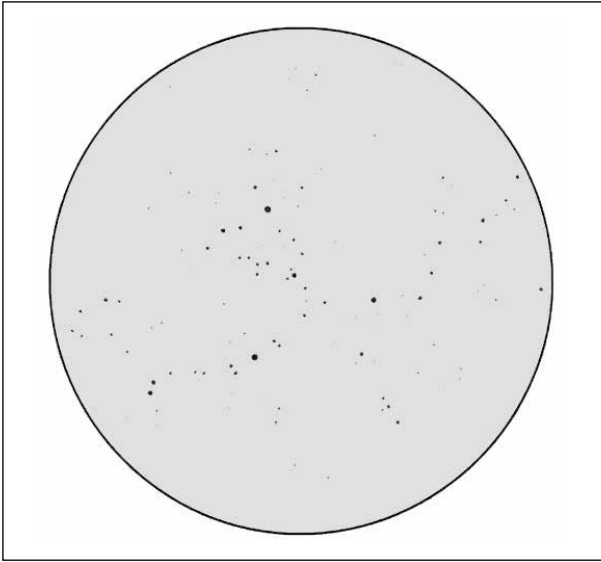
Sometimes Monoceros loses out as far as interest is concerned to its famous neighbours. Nonetheless, Monoceros is not insignificant, housing, as it does, few exceptional and interesting, frequently described objects.

Only a few arc-minutes north of the boundary with Canis Major, approximately 3000 light-years away, hangs the star cluster **NGC 2353** in a haze of nebulosity. What a lovely cluster of approximately two dozen varied-magnitude stars in a slightly elongated north-east to south-west oval. A dark lane appears to divide the group into two parts: the northern section, with slightly brighter stars arranged in an arrow-like shape that brings to mind the typical traffic arrow indicating which way to go. Several fainter stars comprise the southern part; accompanying a magnitude 5.9 shiny white coloured star. A pair of magnitude 10 stars indicate the heart of the group.

However, the star cluster NGC 2353 conceals a slight hitch. The star field is quite busy and the controversy involves the listed NGC 2353 (H V111-34), discovered by William Herschel. William's son, John Herschel, never found NGC 2353 (H V111-34), which he most certainly would have in the same star field sweep. However, he did document NGC 2351 (h437), with a one-degree error from his father William. There is strong evidence that the two objects NGC 2353 and NGC 2351 as described are one and the same.



NGC 2353 – Photograph:
CloudyNights



NGC 2323 – M50 – Open Cluster

One of Monoceros's famous objects is the open cluster **NGC 2323**, perhaps better known as Messier 50, which can be found easily with only the aid of binoculars, and is located 4 degrees west of NGC 2353. However, NGC 2323 is a large, bright cluster which could easily contain 80 stars or more. The north-eastern part is quite compressed, with several chains and stars in pairs that represent the indicated look. Two prominent strings spread out to the south-east and north-west, create the impression of the wings. The grouping, in an elongated north-west to south-

east direction might resemble, perhaps, a bird in flight – or a housefly, to use the words of astronomy friend Sue French!



NGC 2323 – M50 – Photograph: Dale Liebenberg

In the far west of the constellation the hind leg of the horse figure may be seen as represented by the star beta Monocerotis, also called Herschel's Wonder Star. What a lovely trio of blue-white suns in a tight, slender formation, which leaves an impression to remember. The three stars, classed with a spectrum of Type-B2, vary in magnitude: 4.7, 5.2 and 6.1 respectively.

An object discussed among amateurs is the Red Rectangle Nebula indicated as **HD 44179**, about 4 degrees south and in a triangle with beta and gamma Monocerotis and a degree north of the boundary with Canis Major. The Red Rectangle adjoining the star ranks right up as one of the most difficult objects ever to discern. What is fascinating is all the nicknames given to many of the objects that leaves one with thoughts of nostalgia and amazement, but oh dear, to try and discern this object as a faint little rectangle is nearly impossible. The nebula, so called because of its red colour and unique rectangular shape, is a proto planetary nebula. It was discovered in 1973 during a rocket flight associated with the AFCRL Infrared Sky Survey called Hi-Star. The combine system was first discovered by Robert Grant Aitken in 1915.

Perhaps the best-known object and most certainly a very beautiful object is situated 2 degrees east of epsilon Monocerotis in the far north-western field of the constellation. The nebula is a large, low surface brightness object covered with faint star dust, but can unfortunately be appreciated to its full only with slightly larger power than binoculars. This lovely ring of segmented areas is assigned with different NGC numbers, but it is advisable to use a nebular filter with a medium size telescope to bring out the various parts in full. The brightest part of the nebula is situated mostly in the north-western part. The crown of this beautiful, hazy rosette is the star cluster **NGC 2244**, which is enveloped within the superfine nebulosity. The tight grouping contains perhaps a few dozen very hot Type-O stars of various magnitudes. The object as a whole is about 90 light-years distant and more than 25 light-years across. It is an outstanding, rich area in combination with flimsy pieces of nebulosity, faint stars dotted in and around to make this one of the most special objects to have been discovered. The name Rosette had achieved currency only in the early 1950s, but was fairly well known by 1955.

The north-eastern inner wall of the nebula is much wider but fainter, with the cluster **NGC 2252** situated on the edge. This grouping is one of those rare types which in starlight tell a story without words. The irregular shape can be described as a fish-hook decoration in a north-south direction with the hook on the northern edge.

A further 3.5 degrees north is **NGC 2251**, another storybook cluster not to be missed. If you ever see a star formation resembling an eye, complete with eyelashes, then this would be it! A knot of brighter stars represents the focus eye, occupying the spot inside a half-moon eyeball shape looking west. Star points flick out towards the east, just like a nice and curly eyelash. Small open clusters are a joy to observe and most of the time a starry story can be seen in their numerous shapes.

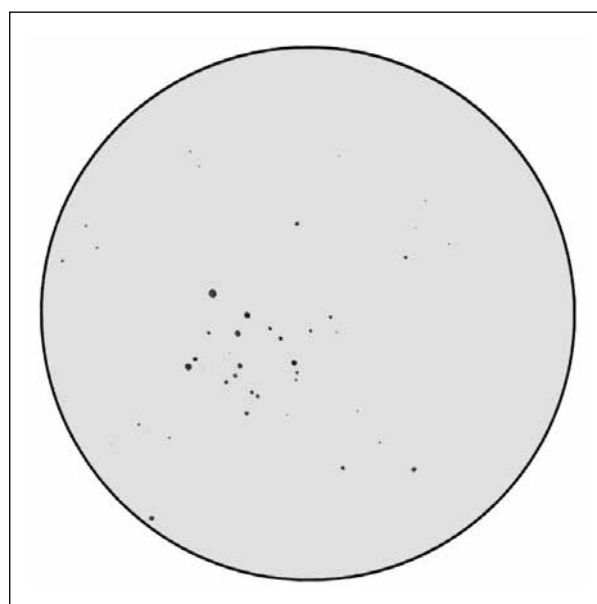
Another degree further north-east the well-known and very special variable star R Monocerotis accompanies a fan-shaped nebula. Known as Hubble's Variable Nebula, or **NGC 2261**, it displays a reflecting comet-like nebula with the star R Monocerotis at the southern tip. Although faint and not so easy to discern, the western side of the nebula seems slightly brighter. It was named after the young Edwin Hubble in 1916, which discovered that the nebulosity around the young hot star R Monocerotis varied in brightness and shape. It is a classic reflection nebula with powerful stellar winds that produce the comet-like nebula we see today. Hubble's Variable Nebula was the first object photographed by the 200-inch Hale Telescope at Mount Palomar in 1949. I am totally convinced that a number of backyard amateurs excitedly believed they had discovered a new comet, only to be disappointed when they found out what it really was. Note that the magnitudes and sizes of the indicated Emission and Reflecting Nebulae are just estimated.

Less than 2 degrees from the boundary with Gemini, is **NGC 2264**, another splendid object in an outstanding field of view. It is nicknamed the Christmas Tree Cluster because of its triangular shape. To find it, locate 15-Monocerotis in the far northern part of the constellation, and you'll be right in the midst of it. This bright, large cluster, which spans more or less half a degree in a north-south direction, is easily seen through binoculars. Careful observation through a telescope, however, reveals about 20 stars embedded in flimsy nebulosity, which tapers down to the south, ending with the famous Cone Nebula (LBN 912), an obscure dust cloud which is extremely difficult to see. Higher magnification reveals a mist of Christmas decorations shining like sparkling faint stars, covering the starry tree in frosted glitter. NGC 2264 is more or less 20 light-years in diameter and approximately 3000 light-years away.

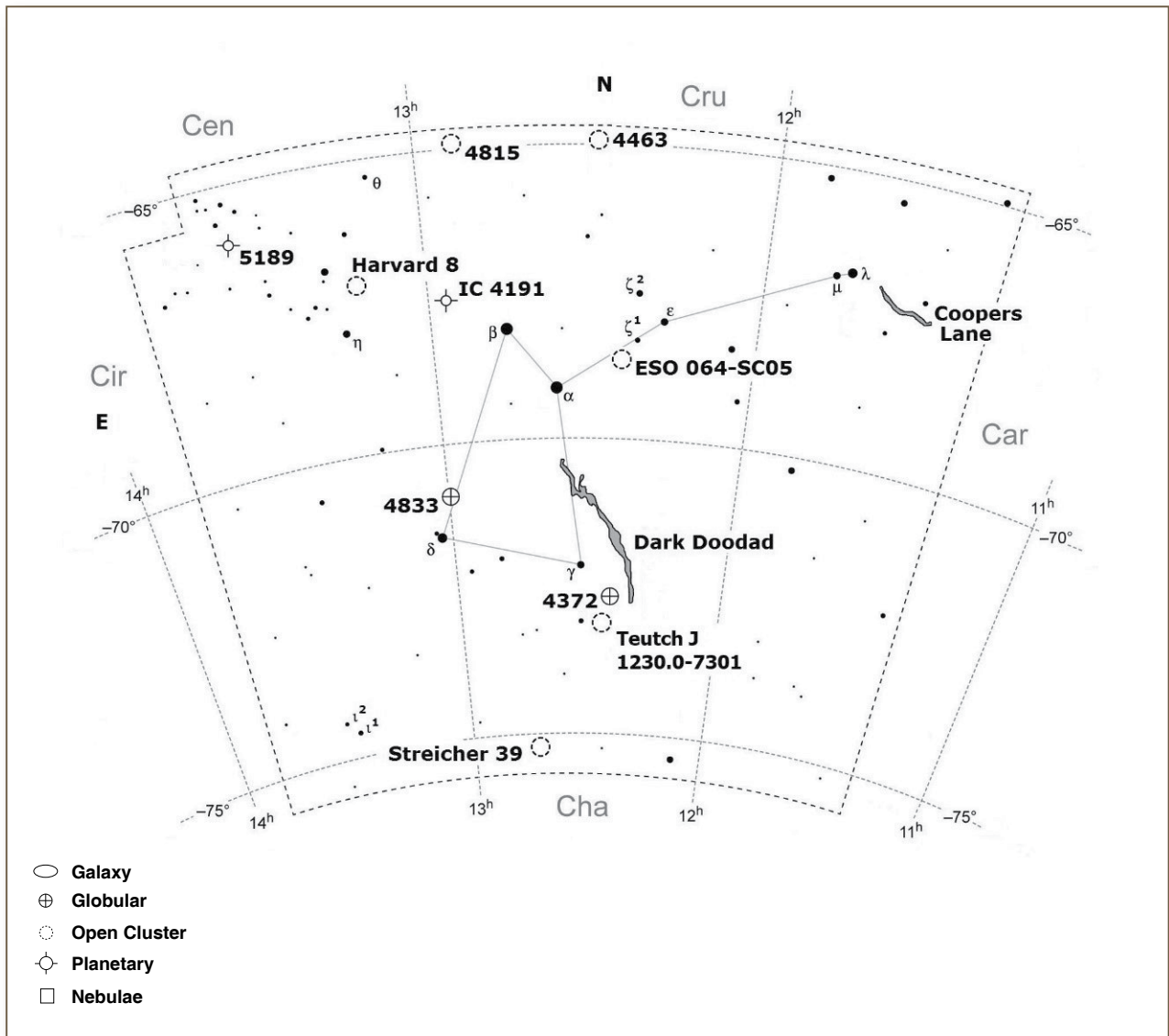
The magnitude 4 delta Monocerotis can perhaps be seen as the rounding of the horse's back in the overall shape of the constellation. The planetary nebula **NGC 2346** is only 40' west from the star. The object is not that difficult to observe, despite being somewhat small in size. Averted vision causes a blinking effect, which is a good way to glimpse detail like the central star and the light-grey colour of the nebula. Higher magnification will reveal a hazy edge with a more obvious confirmation of the planetary nebula as a whole.

Dress warmly and get on the back of the starry Unicorn, stop on your way and drink from the ponds of delights it has to offer.

OBJECT	TYPE	RA	DEC	MAG	SIZE
HD 44179	Reflecting Nebula	06h19m.8	-10°38'.4	9	30"
NGC 2244	Open Cluster	06h32m.4	+04°51'.3	4.8	23'
NGC 2251	Open Cluster	06h34m.7	+08°22'.6	7.3	10'
NGC 2252	Open Cluster	06h35m.0	+05°23'.0	7.7	20'
NGC 2261	Reflecting Nebula	06h39m.2	+08°44'.0	3.5	3'x2.5'
NGC 2264	Nebula and Open Cluster	06h41m.1	+09°53'.4	3.9	30'
NGC 2323 Messier 50	Open Cluster	07h03m.2	-08°20'.0	5.9	16'
NGC 2346	Planetary Nebula	07h09m.3	-00°48'.0	11.6	55"
NGC 2353 NGC 2351	Open Cluster	07h14m.6	-10°18'.0	7.1	18'



NGC 2343 – Open Cluster



The constellation of Musca



Motivation can also be a challenge for the young at heart as is shown in this sketch by my grandchild, Chanté who was only four years old at the time. Of course, it shows grandma and her telescope under the stars!

MUSCA

The Heavenly Fly

The Southern Cross is the pride of our Southern Hemisphere. Not only does its long axis direct the way to true south but it also shows the way to its southern neighbour Musca the Fly, a constellation named after an insect. Johann Bayer, the German lawyer who introduced the system of identifying stars within a constellation using Greek letters, originally named

this constellation in 1603 as Apis. Edmond Halley changed the name to Musca Apis in 1679, while Nicolas Louis de Lacaille, who established the framework for southern hemisphere astronomy, called it Musca Australis on his 1752-star atlas. Today it is known simply as Musca. I have always been fascinated by this constellation, which, although small, harbours extraordinary objects and thus rightfully takes its place amongst the heavenly host.



The star beta Muscae was most probably seen by de Lacaille as part of the insect's body. It is a double star, consisting of two shining white stars of magnitude 3.5 and 4, which are rather difficult to split as the separation is only 1.4". The rest of the body consists of the star's alpha towards the west, delta at the south-east and gamma towards the south-west corner.

Blue-yellow coloured gamma Muscae shows the direction to a jewel globular cluster, only 44' towards the south-west. **NGC 4372** appears as a large frosted round smudge, scattered and covered with many faint light-points. Closer investigation shows it hosting a mixture of star magnitudes, which become gradually denser towards the middle. In the north-western part of the cluster a lovely white magnitude 6 star can be seen and it seems as if star strings follow this bright star, evoking the image of chicks following a mother-hen. The cluster is also known as Bennett 50.

TEUTSCH DSH J1230.0-7301 is a grouping of approximately 12 beautifully prominent stars against the background star-field a few arc-minutes south of NGC 4372, and attracts immediate attention. Philipp Teutsch is from the university of Innsbruck, searching mainly for very faint planetary nebulae.



Dark Nebula – photograph: APOD-NASA

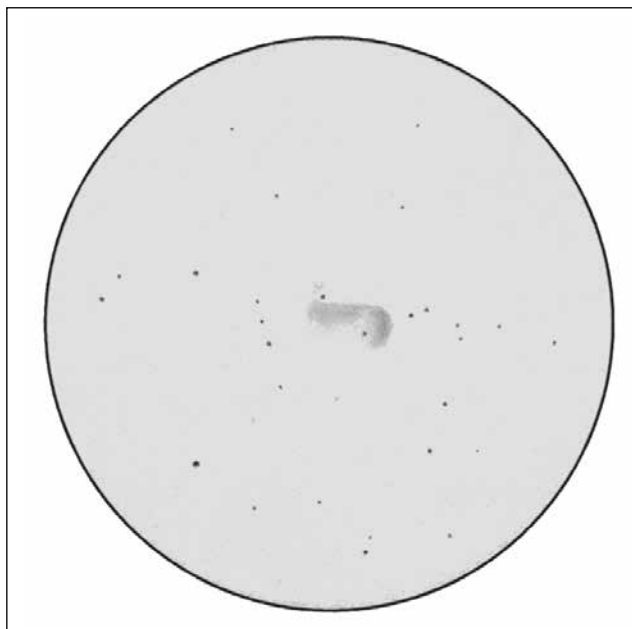
Musca conceals a unique dark nebula called the Dark Doodad. This lovely, fine streak of darkness was given the contemporary name by Dennis di Cicco together with others – and the name has stuck. It would not surprise me if most people have never heard of it, since very few catalogues list it. Where can the Dark Doodad be found? It reveals itself in absolutely dark skies as a long, narrow, dark nebula running for almost 3 degrees northwards. The northern part swings slightly east, but is also the part which is darker and wider. This slim dark lane is situated immediately west of NGC 4372 and gamma Muscae.

NGC 4833 is another remarkable globular cluster in Musca and situated just 43' north of delta Muscae, which could well be indicated the wing tip of the starry fly. My first impression of NGC 4833 is a compact object which reminds me of a misty comet. With higher magnification it gradually brightens towards a rather broad tight centre, which is overwhelming. The spreading out of stars in a north-western direction is reasonably apparent and tapers down to a sharp south-east point to form a triangle, where a lovely tight splash of condensed faint stars reveals themselves. Faint outliers can be seen with hints of dark lanes, more so in the western fringes of the cluster. The object is also known as Bennett 56. This outstanding globular was discovered by de Lacaille in 1751 and included in his 1755 catalogue.

Towards the northern part of the constellation a number of planetary nebulae are to be found, although they are rather faint. One of the brightest is **IC 4191** situated about 2 degrees to the north-east of beta Muscae, and just north of two magnitude 11 stars. The planetary nebula reveals itself only as a hazy stellar object. The busy star field is highlighted by the impressive magnitude 6-star HD 113919 about 9' south, wearing an orange coloured cloak.

HARVARD 8 can be found between the two planetary nebulae IC 4191 about a third the way towards NGC 5189. The cluster consists of approximately a dozen faint stars in a dainty curly formation north-south, about 5' in length. Situated to the west is a pair of close stars, which round it off beautifully. The magnitude 8-star HD 115267 is situated a few arc-minutes north of the cluster and can serve as a direction point.

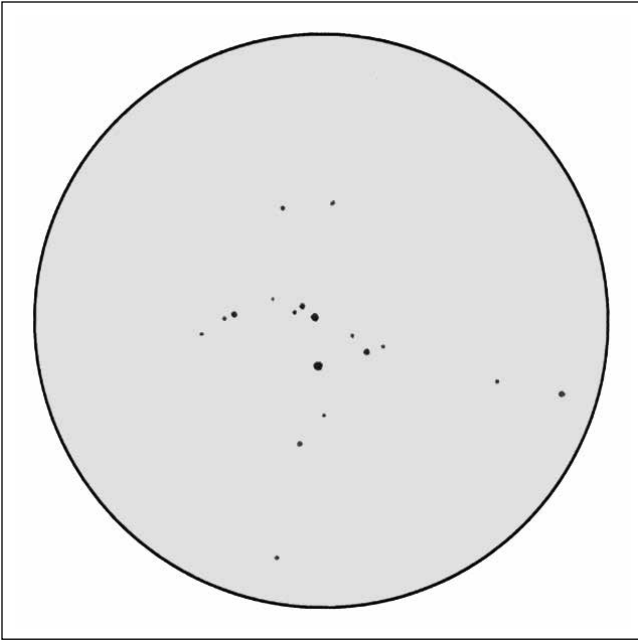
NGC 5189, is the constellation's showpiece planetary nebula, about 3 degrees north-east of IC 4191, bordering the constellation Circinus. John Herschel discovered this remarkable planetary nebula in 1835 and described it as a very strange object. The credit however goes to James Dunlop, who found it on 1 July 1826. My first impression of this nebula was that it showed a lot of detail with a relatively well-defined western part. This impressive object displays a bright curved bar in an east-west direction, which is well underlined to the north with a hazy inner southern part. With higher magnification, faint stars can be seen embedded in the flimsy arms of the nebula.



NGC 5189 – Planetary Nebula

The star theta Muscae displays a primary star in a blue-cream colour with the companion a slightly misty blue. Experience has taught me that when the colour of a double star needs discerning, first impressions are vital. The longer stars are observed, the fainter the colours appear to be. John Herschel was the first to make a reliable measurement of theta Muscae, with no real change since.

The open star cluster **NGC 4815** is situated on the border between Musca and Centaurus, just a degree north-west of theta Muscae. I cannot help but agree with John Herschel concerning the strangeness of some deep sky objects. NGC 4815 is a faint, relatively compact and stringy cluster. At higher magnification it shows a funny, slightly curved figure facing west with approximately 20 stars involved.



NGC 4463 – Open Cluster

Following the line west along the Crux/Musca border to locate the open cluster **NGC 4463** which is bisected by the border of the two constellations. The stars in this grouping are very loose and have the shape of a north-pointing broken arrow, or a blunt arrow with drop-shoulders. The cluster stands out clearly against the background star field.

The constellation Musca offers a rich harvest of lesser-known objects, recorded in catalogues such as the ESO, Harvard, Collinder, van den Bergh-Hagen, Ruprecht and many more.

ESO 064-SC05 is situated only 18' south-east of zeta Musca. The grouping consists of approximately 15 stars, which amazingly form the shape of a spoon. The handle is a string of three stars, which run out to the east and is slightly brighter than the spoon full of fainter stars facing south. Surprisingly, this grouping can also be seen through binoculars.



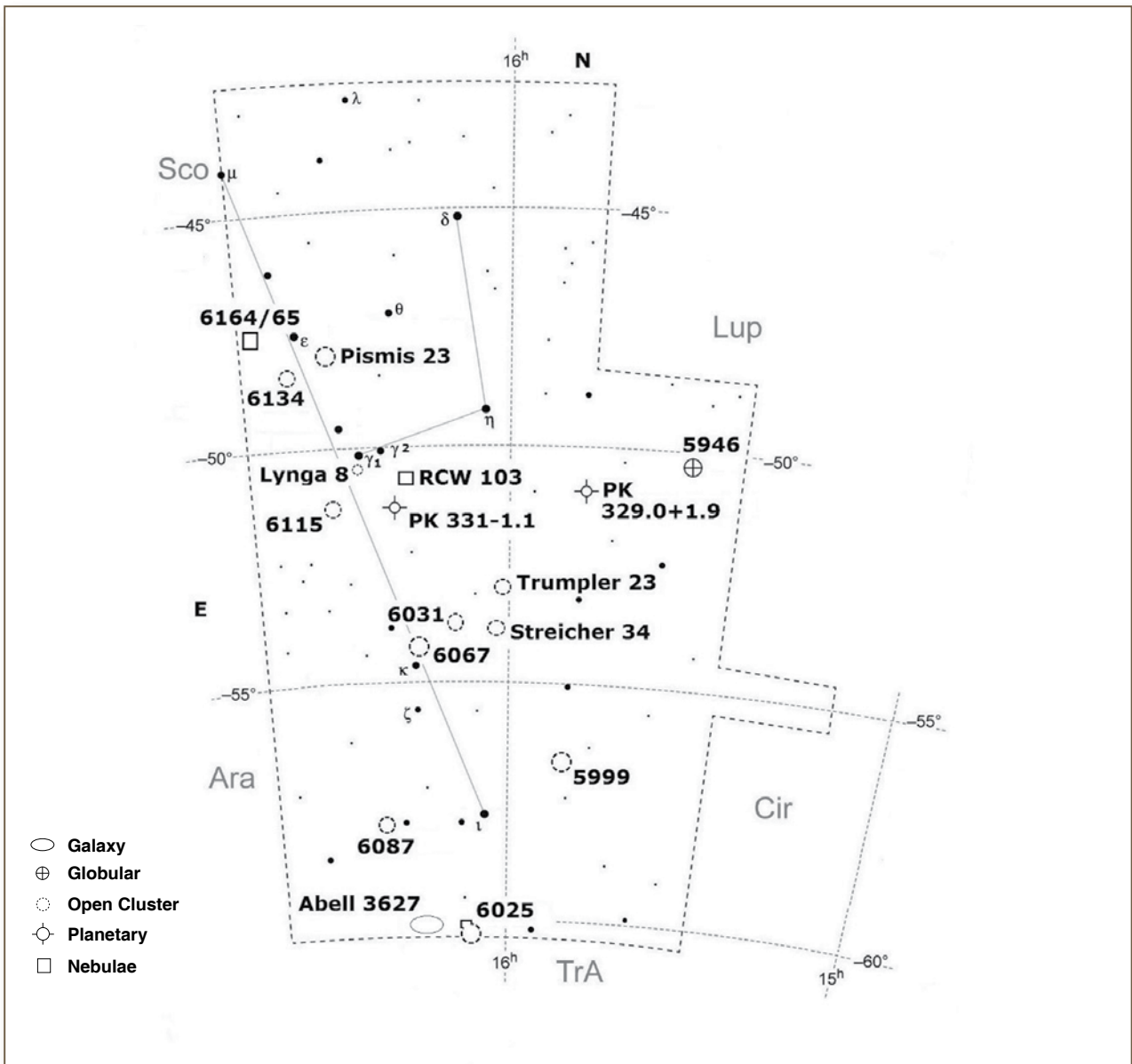
The starry sky is full of asterisms that brings to mind all sorts of shapes. **STREICHER 39** is situated in the far southern part, 20' north of the border with the constellation Chamaeleon. This asterism represents a sort of Japanese fan in shape. The brightest stars are to the south and from there it extends outwards to the north, where fainter stars complete the impression.

Photograph: DSS

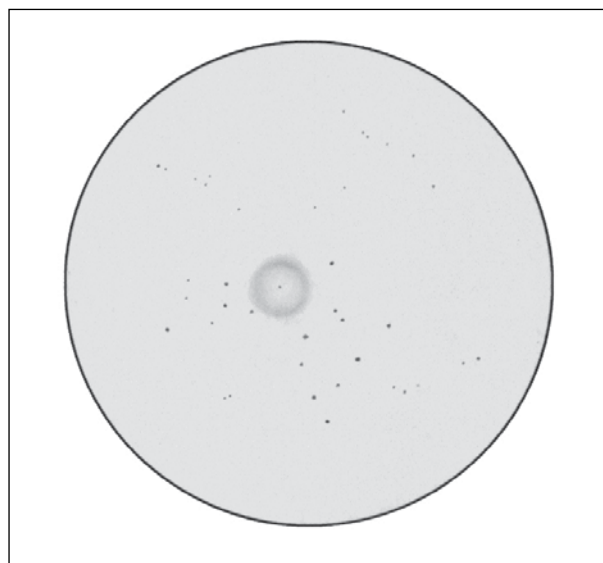
Just south-west of magnitude 3.6 lambda Muscae, a dark lane is visible under truly dark sky conditions against a busy star background. Tim Cooper observed this dark lane with 16×50 binoculars, extending for a little over a degree in a south-west direction. It is straddled by two magnitude 6-stars, HD 100382 and HD 101162.

The universe is full of the unknown, yet also full of wondrous surprises. You will find them only if you take the time to search for them.

OBJECT	TYPE	RA	DEC	MAG	SIZE
ESO 064-SC05	Open Cluster	12h24m.5	-68°28'.0	9.8	10'
NGC 4372	Globular Cluster	12h25m.8	-72°39'.0	7.3	18.6'
NGC 4463	Open Cluster	12h30m.0	-64°48'.0	7.2	5'
TEUTSCH DSH J1230.0-7301	Asterism	12h30m.0	-73°01'.0	8	12'
STREICHER 39 DHS J1232.4-7627	Asterism	12h32m.4	-76°27'.1	13	9'
NGC 4815	Open Cluster	12h58m.0	-64°57'.0	8.6	3'
NGC 4833	Globular Cluster	12h59m.6	-70°53'.0	7	13.5'
IC 4191	Planetary Nebula	13h08m.8	-67°39'.0	10.6	5"
HARVARD 8	Open Cluster	13h18m.2	-67°05'.0	9.5	5'
NGC 5189	Planetary Nebula	13h33m.5	-65°59'.0	9.9	153"



The constellation of Norma

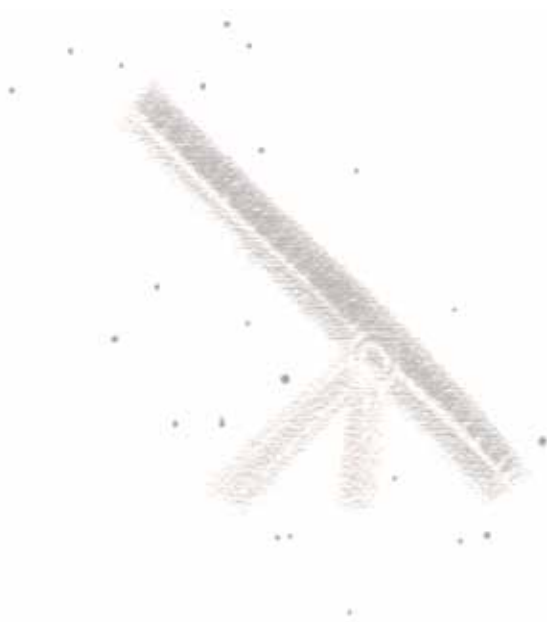


PK 329.0+1.9 – Planetary Nebula

NORMA

Level the Square with Norma

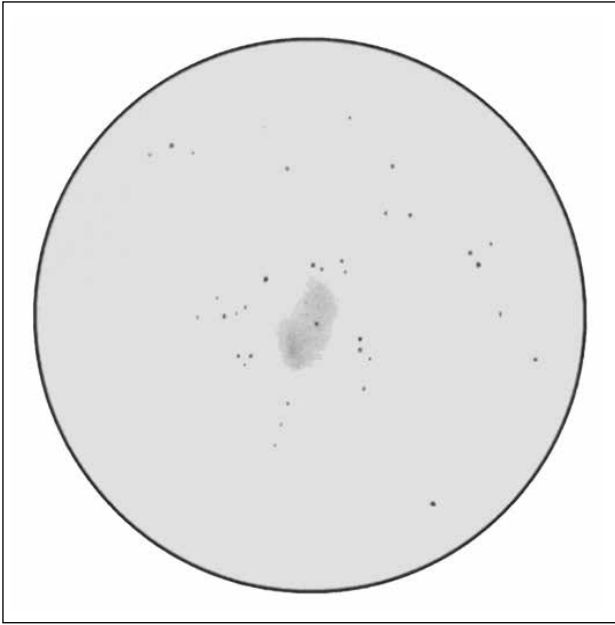
The constellation Norma "Norma et Regula, the Level and Square" is one of the neglected constellations, situated close to the Milky Way, which spreads its breath-taking soft band during the southern hemisphere winter months. Located just to the south of Scorpius, between Lupus and Ara, Norma only consists of stars fainter than magnitude 4. Norma's claim to fame is its many star clusters in a surprising variety. Nicolas Louis de Lacaille, who preferred names relating to instruments of the arts and sciences rather than to mythological figures, originally named this constellation Norma et Regula, the Set Square and Ruler. When the boundaries of the constellation were formally defined in 1930, it lost the alpha and beta stars that de Lacaille had originally assigned to it. These ended up in the neighbouring constellation Scorpius instead.



The globular cluster **NGC 5946** is situated in the far western part of the constellation. It is just a small cloud of mist, but surprisingly obvious. Higher magnification reveals a sandpaper impression, and averted vision brings out the faint flickering of starlight on its surface. The edges become slightly rough and uneven.

A beautiful ring planetary nebula **PK 329.0+1.9** is situated 2.5 degrees east of NGC 5946. My notes indicate a complete round figure seen with high magnification. The inner halo fades towards the middle area, with a glimpse of the central star. The western edge of the nebula seems slightly thicker and brighter. It was discovered by Harvard College Observatory astronomer Harlow Shapley in 1936. Popularly known as Shapley I, it measures 72" and is illuminated by its magnitude 14 central star. Perek and Kohoutek published their catalogue Galactic Planetary Nebulae, which contains 1036 nebulae, in 1967.

PISMIS 23 is situated 1.5 degrees south of epsilon Normae and has a faint, elongated east to west stringy formation.



NGC 6164/6165 – Planetary Nebula

On the eastern boundary with the constellation Ara the planetary nebula **NGC 6164/6165** takes up home just a degree slightly south-east of magnitude 4.5 epsilon Normae. The combined north-west to south-east glow of the two numbered objects is barely visible. NGC 6165, the south-eastern part, is the brighter of the two. It is very difficult to make out any surface texture, although the centre star is easily seen towards the middle area of the nebula. The cluster Ruprecht 120 is situated in the same field of view only 15' towards the south-east.

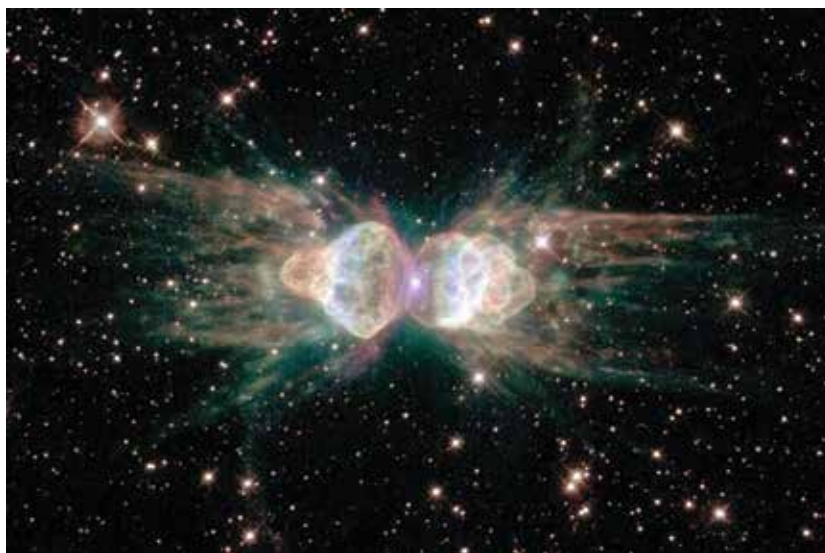
The sparkling cluster **NGC 6134**, also known as Bennett 76, is situated about halfway between epsilon and gamma Normae, and is approximately 4000 light-years distant. The members of differing magnitudes, are well spaced out and in a sort of round dish shape. At the southern end is a lovely blue-white magnitude 9 star, along with an array of faint stars just to the west pointing south. This flimsy grouping plays host to several stars that appear double.

The brightest star in the constellation is the obvious double star gamma Normae, with the brighter member an orange giant some 130 light-years distant. Together with eta, epsilon and delta Normae, it forms the Norma square. This area is home to many small open clusters, a scene to feast the eye on.

The small group **LYNGA 8** is situated only a few arc-minutes south of gamma, but is very faint and difficult to discern, being only 1' in size. Gosta Lynga together with others compiled the Catalogue of Open Cluster Data.

The supernova remnant **RCW 103** is a faint object, a challenge, but not impossible to succeed in observing with a relatively large telescope and very dark night starry skies. The diffuse glow was barely glimpsed in a slightly elongated south-east to north-west direction, a degree south of gamma Normae. A.W. Rodgers, C.T. Campbell and J.B. Whiteoak compiled a catalogue of H α -Emission Regions in the Southern Milky Way during 1955.

Popular for its unique Hubble picture, the planetary nebula Menzel 3, or **PK 331-1.1**, also known as the Ant Nebula, is situated a further degree south from RCW 103. Discovered in 1922, this planetary nebula could have been shaped by a close giant companion or a strong magnetic field. The faint whisper of light is slightly



PK 331-1.1 – Photograph: Hubble Heritage

rectangular in a north-east to south-west direction given it an hourglass shape. A few faint stars could be seen embedded in the western part of the nebulosity. The Hubble picture resembles the head and thorax of a garden ant, resolving into a pair of fiery lobes. It is by no means an easy object to discern, but it's a great feeling bagging it!

Draw an imaginary line 2 degrees south to encounter a feast of clusters. The centre of attention is **NGC 6115**, which displays a rich scattering of faint stars mingle well with Ruprecht 118 on its eastern border. Two more Ruprecht clusters are situated in the western field of view.

The open cluster **NGC 6031** is situated a further 3 degrees south. In contrast, here is a very dainty grouping with about 15 faint members ranging between magnitudes 11 to 13. Although faint, it still stands out against the background star field. The four core stars are installed in the form of a trapezium, with fainter members. Perhaps in the mind's eye the shape of a smoker's pipe can be seen.

Further into the branches of the Milky Way, 50' south-east from NGC 6031 the glorious bright cluster **NGC 6067** can be seen. This lovely bright swarm of about 100 stars in various magnitudes displays a strong, overwhelming, concentrated centre crowded with members. A few star-strings swing out from the south-western side to give it a slightly elongated north-east to south-west appearance. Even small apertures show NGC 6067 well. The cluster is very pleasing to the eye if you allow yourself time to discover its beauty. It is more or less 6900 light-years away, with an age of about 80 million years. The very small and faint planetary nebula PK 329.5-02.2 is embedded in the southern part of the cluster.

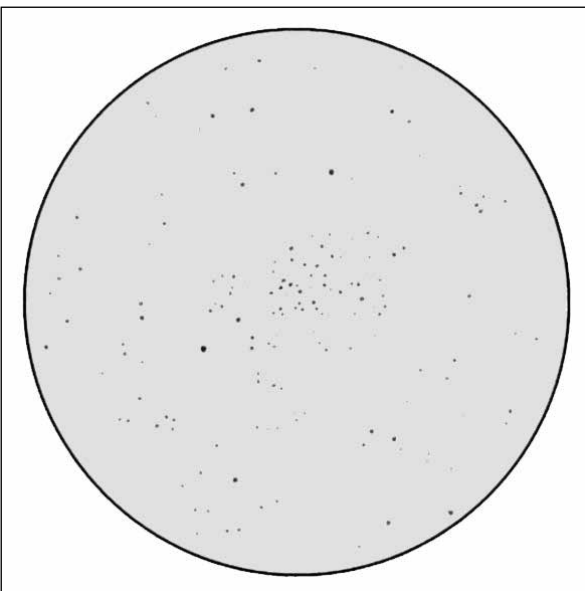


STREICHER 34 – Photograph: DSS

While searching for asterisms I came across a few bright sparkling stars with a difference, **STREICHER 34** situated to the west of NGC 6067. The asterism consists of only five stars and strongly reminds me of an aeroplane or perhaps a sort of bug-face impression. The brightest member HIP 78355, is magnitude 6.1. Don't let this unique one get away; it's one you will always remember!

TRUMPLER 23 and GN 15.55.7
Photograph: DSS

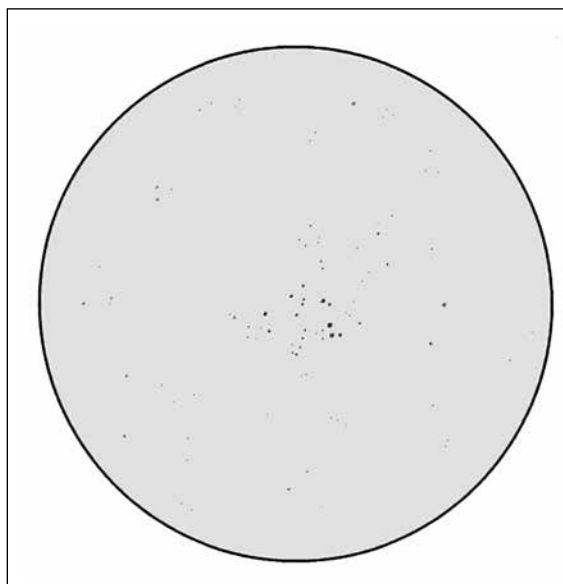
TRUMPLER 23 is situated 2 degrees west of NGC 6067 and well seen in a wide field of view. The grouping displays a large, faint gathering of stars in an elongated north-east to south-west direction. The stars appear to form the shape of the number 2, easily imagined. The nebulae GN 15.55.7 can be seen to the lower south in the photograph.



Further south is the very first object I observed in Norma. **NGC 5999** is a lovely open bundle of rather faint shining stars. The centre is fairly loosely populated with strings and curls of stars swinging out into the field of view. The cluster appears to have a more condensed eastern part. An incredibly faint planetary nebula PK 326.1-01.9 is situated inside the north-eastern part of the cluster.

NGC 5999 – Open Cluster

Locate Iota Normae, a lovely wide double star, in the southern part of the constellation that leads the way a degree east to **NGC 6087**. This is an elongated scattering of lovely bright white stars in an east-west direction. The southern section of stars breaks down rather rapidly in contrast with the northern members, which spray out into the starry field of view. The magnitude 6.5 periodic variable star, S Normae in the centre of the cluster boasts a lovely yellow hue. The star is a member of the cluster. These giant stars can parallel those of Type-M and N stars in temperature. A half-moon of stars is prominent on the western side of the group in a north-south direction. This cluster is beautiful in its own right and is clearly observable even with smaller apertures.



NGC 6087 – Open Cluster

On the southern boundary of the constellation is a beautiful cluster named **NGC 6025**. The cluster, situated on the border with Triangulum Australe, displays a bright elongated north-south grouping which is really outstanding against the star field. Its members display more or less the same brightness with star strings that spray out randomly towards the south-west. With care, nebulosity can be spotted towards the eastern side of the cluster.



NGC 6025 – Photograph: Wikimedia

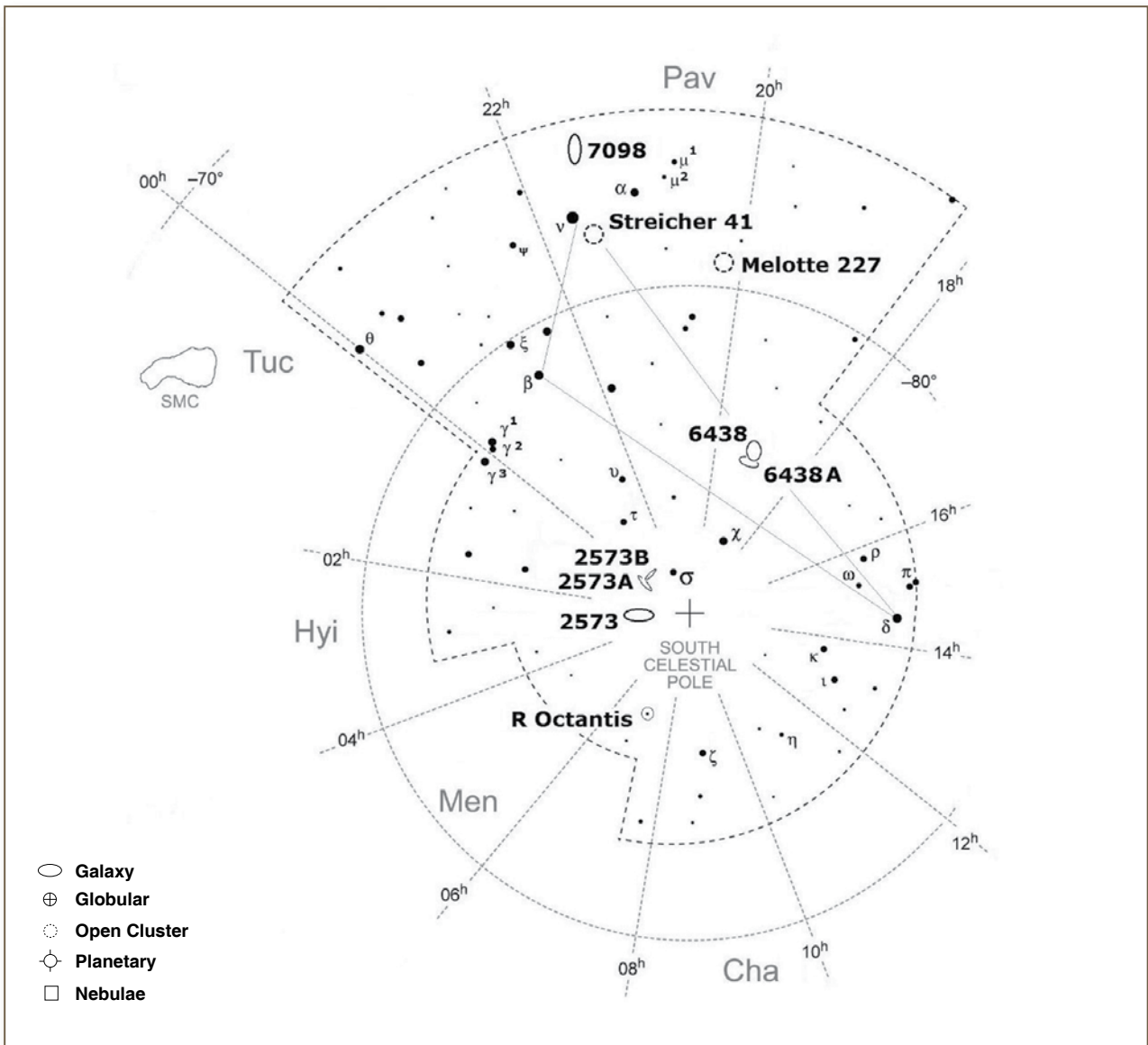
Norma is known for one of the most massive Super Galaxy Cluster just east of NGC 6025. Observations led by Sandra Faber in 1986 show that the group of galaxies, also known as Abell 3627, is moving towards a relatively inconspicuous spot in the constellations Norma. One of the team members, Alan Dressler, dubbed the region The Great Attractor.



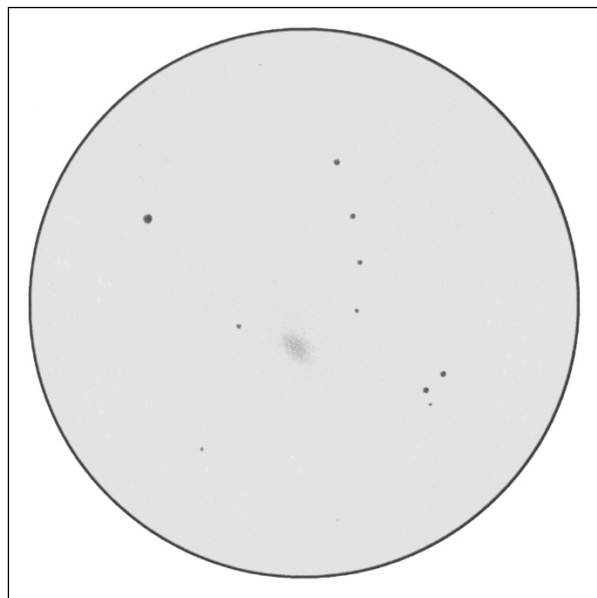
George Ogden Abell (1927-1983) received his BSc (1951), MSc (1952) and PhD (1957) from the California Institute of Technology. He found hints of galaxy super-clusters while searching for galaxy clusters on photographic plates of the Palomar Observatory Sky Survey. Asteroid 3449 was named in his honour as well as the George Abell Observatory in Milton Keynes, England. The first major catalogue of rich galaxy clusters was completed by Abell in 1958 and contains 2712 entries.

Don't neglect open clusters; not only are they still easy to see in our polluted skies, they also bring a splash of delight and wonder to the eye.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5946	Globular Cluster	15h35m.5	-50°39′.5	9.5	7′
PK 329.0+1.9	Planetary Nebula	15h51m.7	-51°31′.0	12.6	72″
NGC 5999	Open Cluster	15h52m.2	-56°28′.0	9	5′
STREICHER 34 DSH J1559.9-5401	Asterism	15h59m.9	-54°01′.9	7	2.3′
TRUMPLER 23	Open Cluster	16h00m.5	-53°31′.8	11.2	9′
NGC 6025	Open Cluster	16h03m.7	-60°29′.8	5.1	12′
NGC 6031	Open Cluster	16h07m.6	-54°04′.0	8.5	2′
NGC 6067	Open Cluster	16h13m.2	-54°13′.1	5.6	12′
PK 331-1.1	Planetary Nebula	16h17m.2	-51°59′.0	9.2	25″
RCW 103	Supernova Remnant	16h17m.6	-51°07′.0	13	570″
NGC 6087	Open Cluster	16h18m.9	-57°54′.0	5.4	12.5′
LYNGA 8	Open Cluster	16h22m.9	-50°10′.9	11	1′
PISMIS 23	Open Cluster	16h23m.9	-48°53′.5	12	1′
NGC 6115	Open Cluster	16h24m.6	-51°57′.2	9.8	3.4′
NGC 6134	Open Cluster	16h27m.7	-49°09′.8	7.2	8′
NGC 6164 NGC 6165	Planetary Nebula	16h33m.8	-48°09′.6	12.6	2.5′



The constellation of Octans

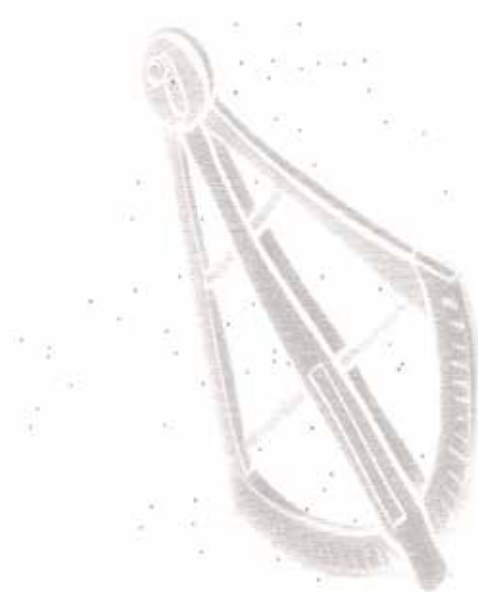


NGC 2573 - Galaxy

OCTANS

Heading for the Pole

Octans is not exactly a constellation that would attract much attention and in addition, it doesn't contain any really bright stars to indicate its shape. But don't underestimate this southern polar constellation. It contains at least a handful of galaxies, a few open star clusters and around 30 double stars. The constellation was apparently named by Nicolas Louis de Lacaille during his visit to the Cape of Good Hope. It is believed that a comedy was even written by John Hadley in 1730 to honour the octant.



The three brightest stars in the constellation form a characteristic triangle with nu, beta and delta Octantis. The sentiments go back to the old seafarers who, in ideal conditions, actually saw the constellation's brighter stars revolving around the pole and were assured of the fact that they were sailing southwards. The south-western heel point, completing the constellation triangle, is the double star delta Octantis. The wide double star nu Octantis is fairly bright and consists of a pair of magnitude 8 yellow coloured stars. The magnitude 5.2-star alpha Octantis can be picked up 2 degrees west of nu Octantis. A little further north is the double star mu Octantis, two beautiful butter-yellow coloured stars, underlined by a string of faint stars in an east-west direction. Because the pole is turning around relatively fast, directions relate to early summer southern hemisphere evenings.

Only 40' east of the southern celestial pole, the nearest galaxy, **NGC 2573**, Polarissima Australis, can be found. The galaxy displays a small, slightly east-west oval puff of light, with low surface brightness and a barely brighter nucleus. The western edge of the galaxy seems to be slightly hazier. A string of more or less evenly spaced stars runs almost 8' towards the south, starting just off the galaxy's eastern edge. It is not an easy object to observe at all. NGC 2573 companion galaxies **NGC 2573A** and **NGC 2573B**, only a few arc-minutes away with both slightly oval in shape. However, the fact that this is a trio of famous galaxies does not make it at all easy to discern, even when using high magnification through a moderate telescope.

The variable star R Octantis is situated approximately 4 degrees south of NGC 2573 and varies between magnitude 6 to 13 in only 13 months. Astronomers designate the first variable star discovered in a constellation with the letter R.



NGC 6438 and NGC 6438A
Photograph: In-The-Sky

Several galaxies call the area around the southern pole home, and was surprised by the brilliance of the merging two galaxies **NGC 6438** and **NGC 6438A**, situated nearly 5 degrees north-west of NGC 2573. The soft oval of the two combined galaxies is relatively obvious. Higher magnification reveals an extension like a wisp attached to the main galaxy's southern end indicates the companion galaxy NGC 6438A which seems elongated. At both ends of these two galaxies, faint pinpoint stars can be seen. A yellow colour magnitude 10 star is situated towards the south-west.



MELOTTE 227 – Photograph: WEBDA

The open star cluster **MELOTTE 227** is situated in a long triangle with alpha and nu Octantis. The main focus is a scattered group of about 20 stars in an elongated north-south direction, roughly 40' in size. This grouping contains a few bright stars and a large handful of fainter ones showing a relatively close formation. Towards the west of this group is a prominent string of stars which could well be part of the group.

In this part of the constellation I came across an asterism now listed in the Deep Sky Hunters Catalogue as **STREICHER 41**. It was great to discover an asterism in our heritage constellation Octans. This star grouping reminds me, in a way, of a glass filled with stars.



STREICHER 41 – Photograph: DSS

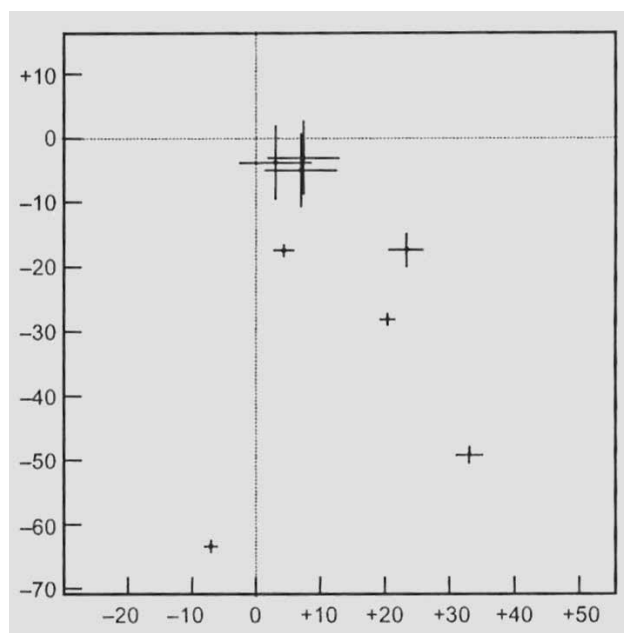


Diagram – Auke Slotegraaf

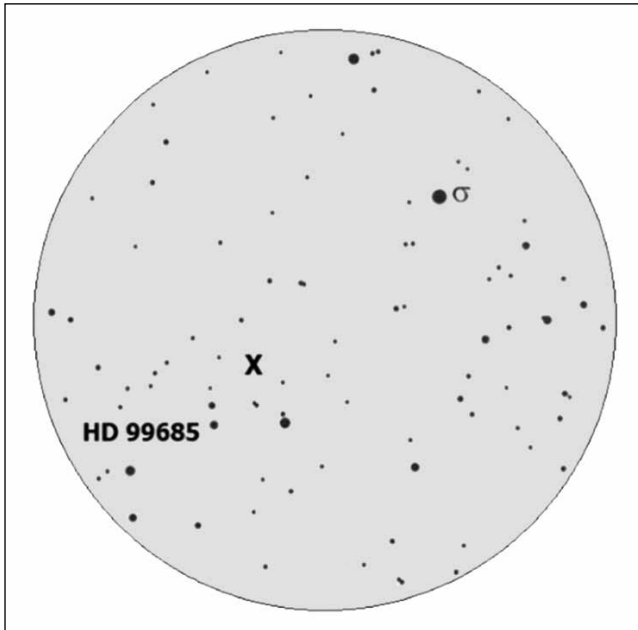
The Vector-point diagram indicates the brightest stars in the asterism Streicher 41. The abscissa shows motion measured in milli arc-seconds per year while the ordinate plots proper motion times in declination.

The galaxy **NGC 7098** is situated only one degree from the border with the constellation Indus. It displays a soft, somewhat circular glow in a north-east to south-west direction and accompanies an outstanding bright star-like nucleus and a soft halo around it. A string of four magnitude 11 stars situated directly towards the north-east of this galaxy.



NGC 7098 – Photograph: Wikipedia

I would venture to believe that the part of the night sky containing the south celestial pole does leave some of us feeling little nostalgic. The magnitude 5.4-star sigma Octantis also called Polaris Australis, came closest to the south celestial pole in 1866 when it was just 43' away. The invisible pole position is now heading towards the magnitude 4.3-star delta Octantis. Because of my adventurous nature often wanting to explore the impossible, I felt compelled to find the exact location.



A mere half a degree from magnitude 5.4 sigma Octantis, this special point can be found in the night sky, but definitely not without effort. The unknown, yet well-known, point in the starry sky is only 12' of the relatively bright magnitude 7.8-star HD 99685, the bottom star of an obvious string of three stars in steps of brightness indicates the way. However, it seems that a magnitude 14-star is the closest star to true south, only 3' away from the celestial south pole.



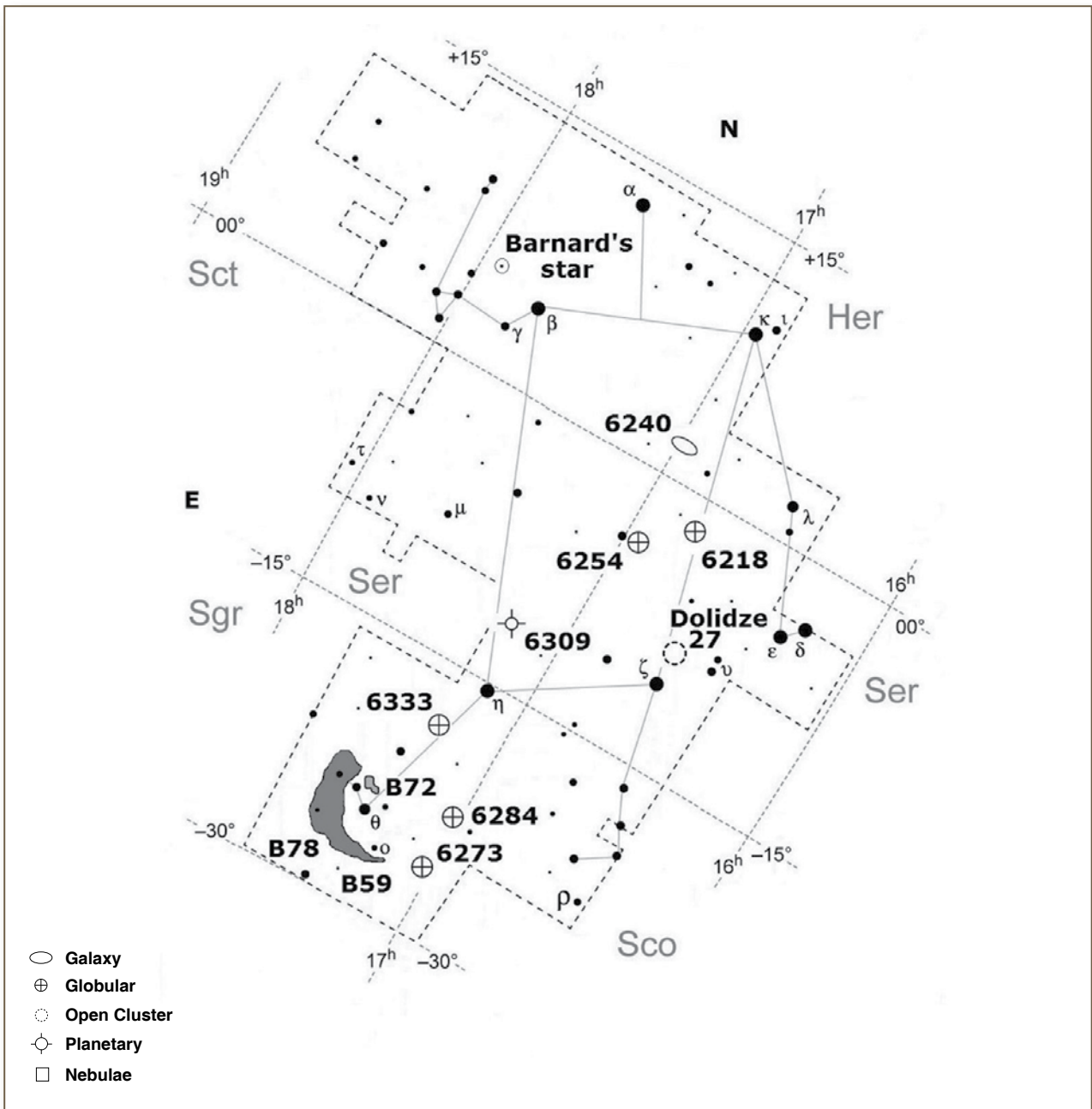
South Celestial Pole – Photograph: Kos Corinado

I hope the thought occurs to you to look up the spot we call the southern starry pole, perhaps it's just the thought that's important when one looks at the few faint stars around this strategic point.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2573	Galaxy	01h42m.0	-89°20'.0	12.8	2'×0.7'
R Octantis	Variable Star	05h26m.1	-86°23'.0	6.4 13.2	Period 406 days
NGC 6438	Galaxy	18h22m.3	-85°24'.0	12.5	1.7'×1.4'
NGC 6438A	Galaxy	18h22m.7	-85°25'.0	13.2	3.2'×1.4'
MELOTTE 227	Open Cluster	20h12m.3	-79°17'.4	5.3	45'
STREICHER 41 DSH J2126.9-7753	Asterism	21h26m.9	-77°53'.0	9	16'
NGC 7098	Galaxy	21h44m.3	-75°07'.0	11.4	4'×2.3'
NGC 2573B	Galaxy	23h07m.2	-89°07'.0	13.5	1.1'×0.4'
NGC 2573A	Galaxy	23h12m.2	-89°08'.0	13.8	1.3'×0.3'



A replica of the octant in the Florence Science Museum – Photograph: Belinda Streicher le Roux



The constellation of Ophiuchus

OPHIUCHUS

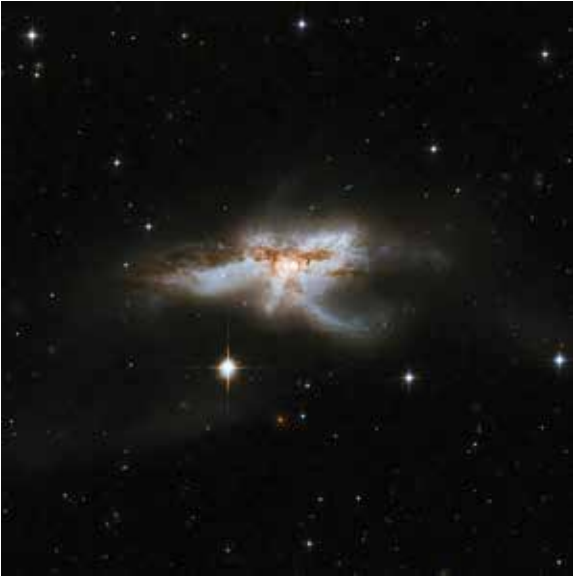
The Herb Healer

Ophiuchus is one of those shady constellations that bring a feeling of mystique to the observer. Ophiuchus the Serpent Bearer was known in ancient times as the herb healer, but there is also a belief that the constellation was named after a Polish king. However, it is because the star formation is very large – eleventh in size out of the 88 constellations and home too many globular clusters. If you have to look for globular clusters in just about all the categories then Ophiuchus offers quite a variety. But it is also a constellation with a few surprises apart from being globular home town. Join me on this out-of-the-ordinary constellation which is perhaps neglected to some extent because of its famous neighbours.



It is only appropriate to kick off a chapter about this globular-rich constellation with a description of the globular cluster **NGC 6218**, also known as Messier 12, which is located towards the western part of the constellation. NGC 6218 is a beautiful, bright globular cluster that is well resolved with varied-magnitude stars. The small core is special in that it is very dense when compared with other globular clusters in Ophiuchus. Clear star strings dance out from the dense core, with two outstanding short strings on the western edge. With higher magnification a slight haziness towards the north-west indicates a few faint stars, which could explain the somewhat oval appearance. In the field of view towards the east of the globular cluster are a few bright stars arranged in a sort of square shape. Charles Messier discovered this beautiful object on the night of 30 May 1764.

The near twin neighbour, **NGC 6254**, also known as Messier 10 and Bennett 83, is situated 3.5 degrees south-east of M12. NGC 6254 is a lovely star-rich globular cluster which displays a flimsy edge. The inner tight core is relatively large, bright and slightly oval in shape. Faint stars dot the surface with a few dark and open patches in between. Higher magnification reveals an outer tenuous edge with a few dainty strings which seem to become busier with starlight towards the southern edge. It is an outstanding object that displays a handful of yellow stars in the glittering stardust.



NGC 6240 – Photograph: Wikipedia

Situated 4.5 degrees north of M12 is the galaxy **NGC 6240**. Although this is only a very faint haze in a slightly elongated direction, it is also a very interesting object. The Hubble picture of this galaxy displays a massive face-on spiral with looping arms and with what appears to be a double nucleus, the result of a collision between two progenitor galaxies. The shape reminds one of butterfly impressions familiar to planetary nebulae.



BARNARD'S star – Photograph: Wikipedia

The magnitude 9.5-star HIP 87937, better known as **BARNARD'S star**, was measured by Edward Emerson Barnard in 1916. This famous star is situated 3.5 degrees east of magnitude 2.7 beta Ophiuchi in the north-eastern part of the constellation. Barnard published a chart, made in June 1816, where his fast-moving star is marked by an arrow. The high proper motion of this magnitude 9.5 dwarf star, which

could be 11 to 12 billion years old, is situated only 5.9 light-years away, second to the alpha Centauri system. An arrow-head asterism in the western field of view points the way towards BARNARD'S star. I observed the star's motion over the years from 2003 to 2010 and found its movement to be 1.2' in position.

The constellation Ophiuchus also has within its borders a few open clusters; one such object is **DOLIDZE 27**, situated halfway between zeta and upsilon Ophiuchi in the western part of the constellation. The cluster displays only a few widely spaced stars in an east-west direction. Part of the cluster is a few members visible in an uneven line towards the western part. The brightest star situated north in this group is magnitude 6.8. Most of the stars in this group display a yellow to deep orange colour.

Georgian astronomer Madona V Dolidze concentrated on surveying emission-line stars, red stars and other objects from the late 1950s well into the 1970s. Most of her work was done using objective-prism plates with the Abastumani 70-cm Maksutov telescope, and star groups were reported only incidentally from these surveys.

The magnitude 2.4 eta Ophiuchi points the way 3 degrees north to the planetary nebula **NGC 6309**, a lovely uneven glow with woolly edges also referred to as the Box Nebula. My first impression was that of an out-of-focus double star, but higher magnification and close investigation showed a magnitude 11 star on the northern rim. The slightly washed-out grey coloured nebula revealed a more defined south-eastern side.



NGC 6309 – Photograph: CloudyNights

The rho Ophiuchi region situated in the south-western corner of the constellation stretches into the neighbouring Scorpius and is surely one of the most outstanding parts of the Milky Way. Different types of objects reside in this cloud of nebulosity and are definitely worth a mention.



rho Ophiuchi region – Photograph: Dieter Willasch

Well into the southern part of the constellation a whole bunch of globular clusters situated close to one another. **NGC 6284**, also known as Bennett 87, finds its home 4 degrees west of the magnitude 3.5 theta Ophiuchi and half-way to the border with the constellation Scorpius. Not all globular clusters are bright, large or rich in stars, and NGC 6284 displays only a small, faint puff of light. With the utmost care and high magnification few specks of starlight can be seen in the soft outer edge. The object arouses in one a very strong sense of the truly enormous distance between the deep starry skies and the eye of the observer. It is striking that the star field to the north-west of this globular cluster is generously scattered with stars, in contrast with the relatively bare south-eastern star field. William Herschel discovered this object in 1784.



NGC 6273 – Photograph: HunterWilson

Barely 1.5 degrees south is **NGC 6273**, also known as Messier 19, which is by contrast a typical rich globular cluster with a pleasant character. It creates a special feeling with its frosted, concentrated look and the impression of a fleecy, speckled edge as if the faint stars are being blown away in a breeze. Higher magnification reveals an unusual star-like core slightly off centre; the reason for the elongated north-south direction. In shape, M19 gives the impression of being one of the largest ovals as far as globular clusters are concerned and almost appears to double in size with averted vision. Several

long chains of faint stars can be seen, and more so towards the north-western part of the globular cluster. The object was discovered by Charles Messier on the night of 5 June 1764.

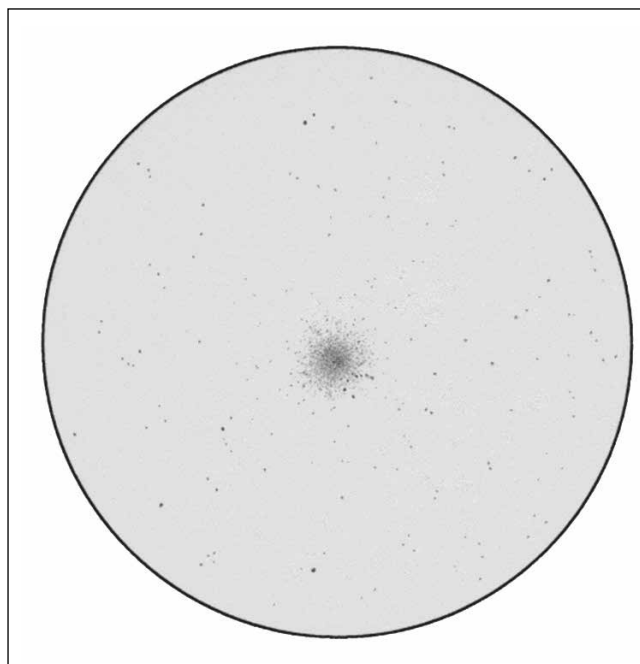
Several dark nebulae can be seen in the constellation, but as we know by now, light pollution stops us from seeing many wonderful objects, which can be found only in ideal dark star-filled night sky conditions. Ophiuchus is famous for a number of well-known dark nebulae discovered by Barnard. Perhaps one of the best known is **B59**, known as The Pipe Nebula, with the stem of the pipe in an area 1.8 degrees south of magnitude 3.2 theta Ophiuchi. Adjacent, north-east is **B78**, which can be seen as the larger dark area also known as the bowl of the pipe. The two objects also go under the names of LDN 1773 and LDN 42 in the Lynds Catalogue of Dark Nebulae.



B72 – Photograph: Dieter Willasch

Another very impressive dark nebula is **B72**, or LDN 66, more popularly known as The Snake Nebula. This clearly defined S-shaped dust lane is situated on the northern edge of B78. The whole area is about 7 degrees in extent. The best way to observe it is to use binoculars, but a dark and transparent sky is definitely a prerequisite.

Just 3.5 degrees south-east of magnitude 2.4 eta Ophiuchi the globular cluster **NGC 6333**, or Messier 9, can be found, with perhaps a nice tale to reveal. This globular is bright, large and roundish in shape with a large, even bright core, but not star-like. The core of the object is not round, but displays a somewhat uneven shape. With careful observation faint stardust can be seen scattered on this round haze of light. High magnification brings to the fore faint stars loosely gathered towards the fringy and grainy edge. On the night of 1 May 1935, Cyril Jackson discovered his first comet (C/1935 M1) barely 12' south of NGC 6333. It can be assumed with reasonable certainty that Jackson was observing M9 when he discovered the comet.



NGC 6333 – Globular Cluster

Cyril Jackson was born in Osset, on the outskirts of Leeds, Yorkshire, England, on 5 December 1903. He immigrated with his father to South Africa in 1911, where he was educated at Forest High School, Johannesburg, becoming their first dux, and he studied further at the University of the Witwatersrand, obtaining a BSc in 1922. In April 1929 Jackson discovered his first minor planet, which he called Catriona. A remarkably productive career followed during which he discovered 72 new minor planets. Most of them were given typically South African names.

Apart from comet C/1935 M1, he discovered his second comet, a magnitude 12 object in Aquarius, on 20 September 1936 on a plate exposed five days earlier using the Franklin-Adams Star Camera. The comet was independently found by Grigory Neujmin in Russia, and is today known as 58P Jackson-Neujmin. Jackson's third comet was found by accident on a plate exposed on 26 August 1948, while he was testing a 50-cm focal length camera for its ability to detect fast-moving minor planets. The comet was found 12 hours earlier by Joseph Ashbrook on a visit to Lowell Observatory (Kronk 1984). This comet, too, is observable today as comet 47P Ashbrook-Jackson.



After his retirement in the early fifties he built a small telescope house on top of a hill in the northern part of South Africa on his farm near the town Haenertsburg to house instruments he had acquired from a German observatory in Namibia. The inscription on the doorway to the observatory reads "Erno

Star House 1955". The National Heritage board is officially declared the site as a local historical monument. I must thank Paul Jackson for the information and the photographs of his father provided to me.



Cyril Jackson – Pencil Sketch – Kathryn van Schalkwyk



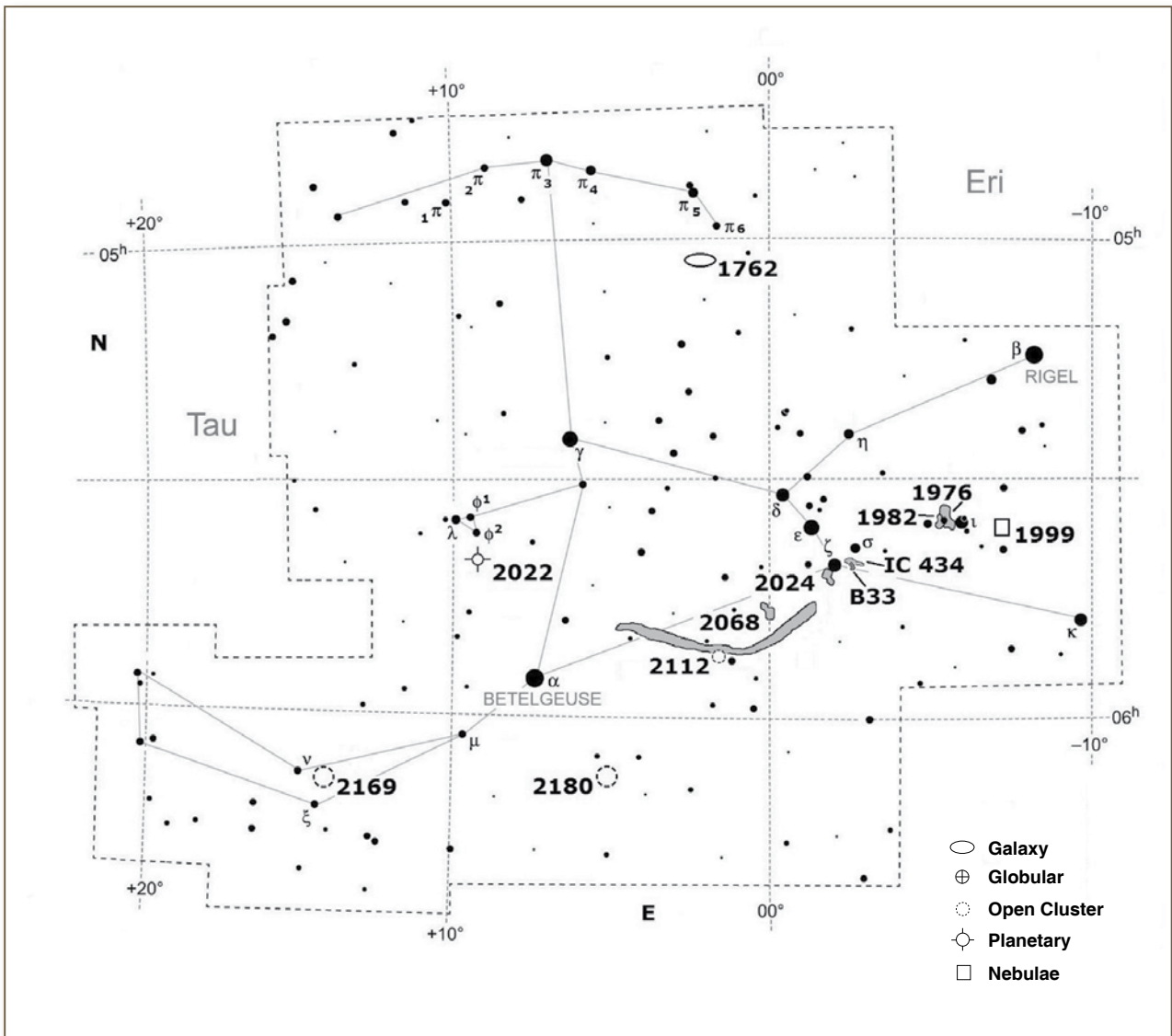
Cyril Jackson with his dog Patches in the early fifties on the site of the observatory shortly before building began.



The sturdy stone structure still houses the pillar with screws on which his telescope had been mounted.

A night sky filled with starry splendour brings with it a feast of satisfaction and a veritable healing for the weary soul, without medication from the doctor!

OBJECT	TYPE	RA	DEC	MAG	SIZE
DOLIDZE 27	Open Cluster	16h36m.5	-08°56'.0	7	25'
NGC 6218	Globular Cluster	16h47m.2	-01°57'.5	6.8	14.5'
NGC 6240	Galaxy	16h53m.0	+02°24'.0	12.9	2'×0.8'
NGC 6254	Globular Cluster	16h57m.1	-04°06'.0	6.6	15.1'
NGC 6273	Globular Cluster	17h02m.6	-26°16'.0	6.7	13.5'
NGC 6284	Globular Cluster	17h04m.5	-24°46'.6	8.9	5.6'
BARNARD 59	Dark Nebula	17h11m.1	-27°23'.0	-	4'
NGC 6309	Planetary Nebula	17h14m.1	-12°54'.7	10.8	16"
NGC 6333 Messier 9	Globular Cluster	17h19m.2	-18°31'.0	7.6	9.3'
BARNARD 78	Dark Nebula	17h21m.1	-26°47'.0	-	6'
BARNARD 72	Dark Nebula	17h23m.5	-23°38'.0	-	5'
BARNARD'S star HIP 87937	Star	17h57m.8	+04°43'.6	9.5	*



The constellation of Orion

ORION

Orion and Friends

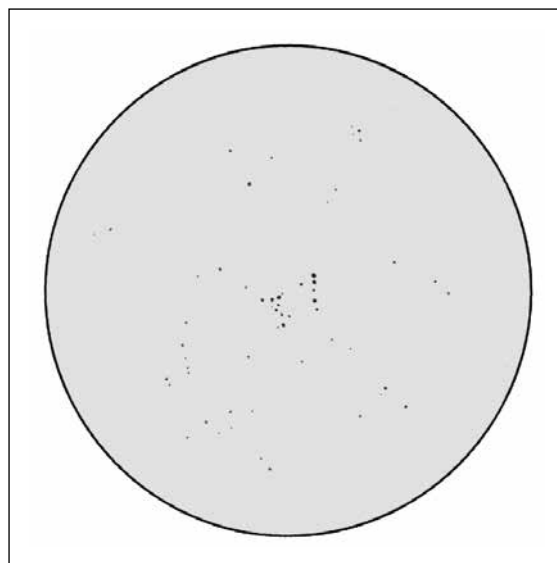
Not only is the end of year a time for reflection, it is also a time to share and welcome in the New Year with friends. When Orion rises in the east at this time of year, southern summer, it truly feels like a visit from an old friend with a bag full of treasures. Orion has it all: various objects, all the different types of nebulae, and many surprises. This is also the constellation, which I share the most with dear astronomy friends. So, let me walk with you down Memory Lane on the arm of the Hunter friend.



Orion contains more bright stars than any other constellation, and within its boundary is the star alpha Orionis or better known as Betelgeuse, one of the most outstanding red giant stars known.

Look for the open cluster **NGC 2180** about 4.5 degrees south-east of the border with Monoceros. The magnitude 7-star HD 42203 lies in the cluster centre, with a spray of stars swinging westwards. The group is slightly elongated in a north-south direction. The western side is busier with less starlight on the eastern periphery.

A special open cluster is **NGC 2169** also known as Cluster 37, situated in the club of the Hunter's raised north-east arm. Sixteen stars of various magnitudes clearly make up the number 37. One group of stars, to the south-east make the number 3, while the north-west group forms the 7. This asterism is a treasure trove in a sprinkled star field.



NGC 2169 – Open Cluster

The planetary nebula **NGC 2022** is situated two-thirds of the way from Betelgeuse in the direction of the group of stars that represents the head of the mighty hunter. This grey-green smoke ring appears slightly elongated in a north-east to south-west direction and darker towards the middle area. A few faint stars can be spotted to the north of the nebula.



NGC 1762 – Photograph: In-The-Sky

Orion also hosts a few galaxies and I fondly remember surprising Dave Gordon and Mary FitzGerald while the mosquitoes were fighting for a place to compete. In a triangle south-west with gamma and delta Orionis found the spiral galaxy **NGC 1762**. The galaxy displays an oval glow with a strong star-like nucleus and a star on the eastern rim. The softer outer envelope extends slightly further to the north. Dave and Mary did not expect to lay eyes on a galaxy situated in the far north of the constellation Orion!



Barnard's Loop – Photograph:
Dieter Willasch

Nebulosity in this constellation is well represented, and comes in a variety of types. Late astronomy friend Mary FitzGerald, a well-informed deep sky observer, and I have spent endless hours trying to glimpse Barnard's loop, formed by ionized wind. The looped nebula is situated on the eastern part of the constellation, stretching around 5 degrees long, visible with a handheld nebular filter in extremely dark skies – if you are lucky. Open cluster **NGC 2112** is situated on the edge of the loop and consists of a handful of faint stars accompanying a few bright yellow coloured stars. Look for the cluster near the right edge, together with the nebulae NGC 2071 and NGC 2068 at the top inside the photograph.

The reflection nebula **NGC 2068** also known as Messier 78, appears as a diffuse glow with a strong core. The south-east flimsy side breezes away from the nebula with a well-defined north-western edge. What makes M78 striking and one to remember are the two magnitude 10 stars embedded in it, which give the impression of a ghost staring back at you. **NGC 2071** is situated only 4' further away.



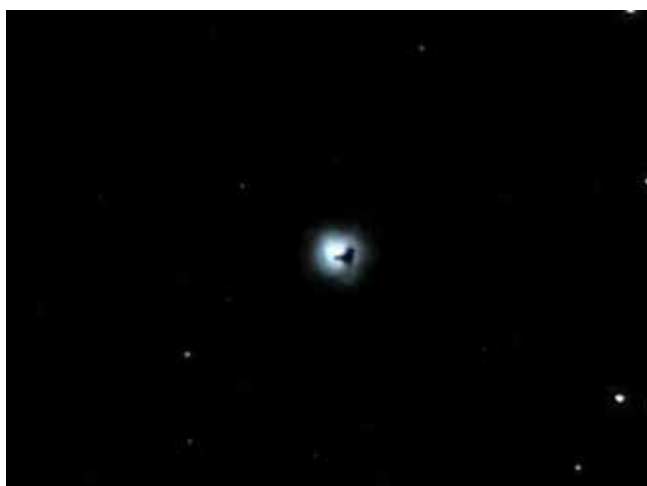
NGC 2068 – Photograph: Lucas Ferreira

The star zeta Orionis highlights the emission nebula **NGC 2024** which is situated towards the east of the star. A prominent dark north-south lane cuts through the nebula with the eastern part being the largest.

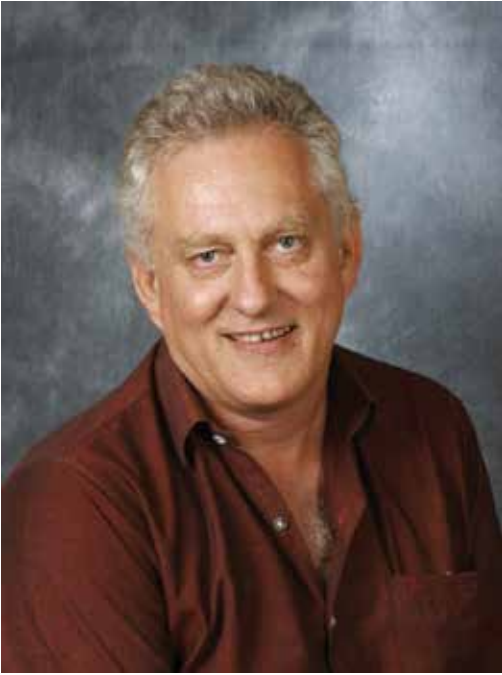


NGC 2024 – Photograph: Lucas Ferreira

In the southern part of the constellation nestles **NGC 1999** a beautiful and outstanding reflecting nebula. The annular form of this gaseous cloud can easily be mistaken for a planetary nebula. The magnitude 10.8 variable star V380 Orionis is situated in the expanding nebulosity slightly towards the east, giving the star an off-centre appearance. Careful observation brings out the T-shaped Bok globule embedded in the nebula's western edge. There are quite a few bow shocks, stellar jets, and stars fainter than magnitude 14 at indicated positions around NGC 1999.



NGC 1999 – Photograph: Lucas Ferreira



According to Professor Derck Smits of UNISA, Herbig-Haro objects are shock-excited nebulae associated with stars in the stage of evolution, with masses less than about 4 solar masses. Jets of material, ejected at velocities up to 400km per second, from the young stellar object (YSO) impact the interstellar medium (ISM), creating a shock front that ionises the gas and produces optically visible nebulae. To have a professor of astronomy as a friend is one thing, to discuss Herbig-Haro objects with him is quite another!

What more can be said about **NGC 1976**, the great Orion Nebula, also known as Messier 42, a grand naked-eye object in the sky's greatest constellation? Almost 40 light-years in diameter, the nebula bathes in the light of the Trapezium, a group of stars including the quadruple star theta Orionis. Stephen O'Meara, award-winning visual observer sees the trapezium as an emerging embryo cradled in a soft womb of nebulosity. He remembers many winter nights walking across snow-laden fields to see this nebula, situated in the middle of Orion's sword, looking like angel's breath against a frosted sky.



NGC 1976 – M42 – Photograph: Bruce Dickson

NGC 1982 or better known as Messier 43 is the comma-shape bright nebula bordering the northern edge of M42. With higher magnification, faint detail becomes visible and separates it from M42 as shown in Bruce Dickson's excellent photograph. Bruce, a loyal friend, provides me often with high-tech gear to filter out the best deep sky objects.

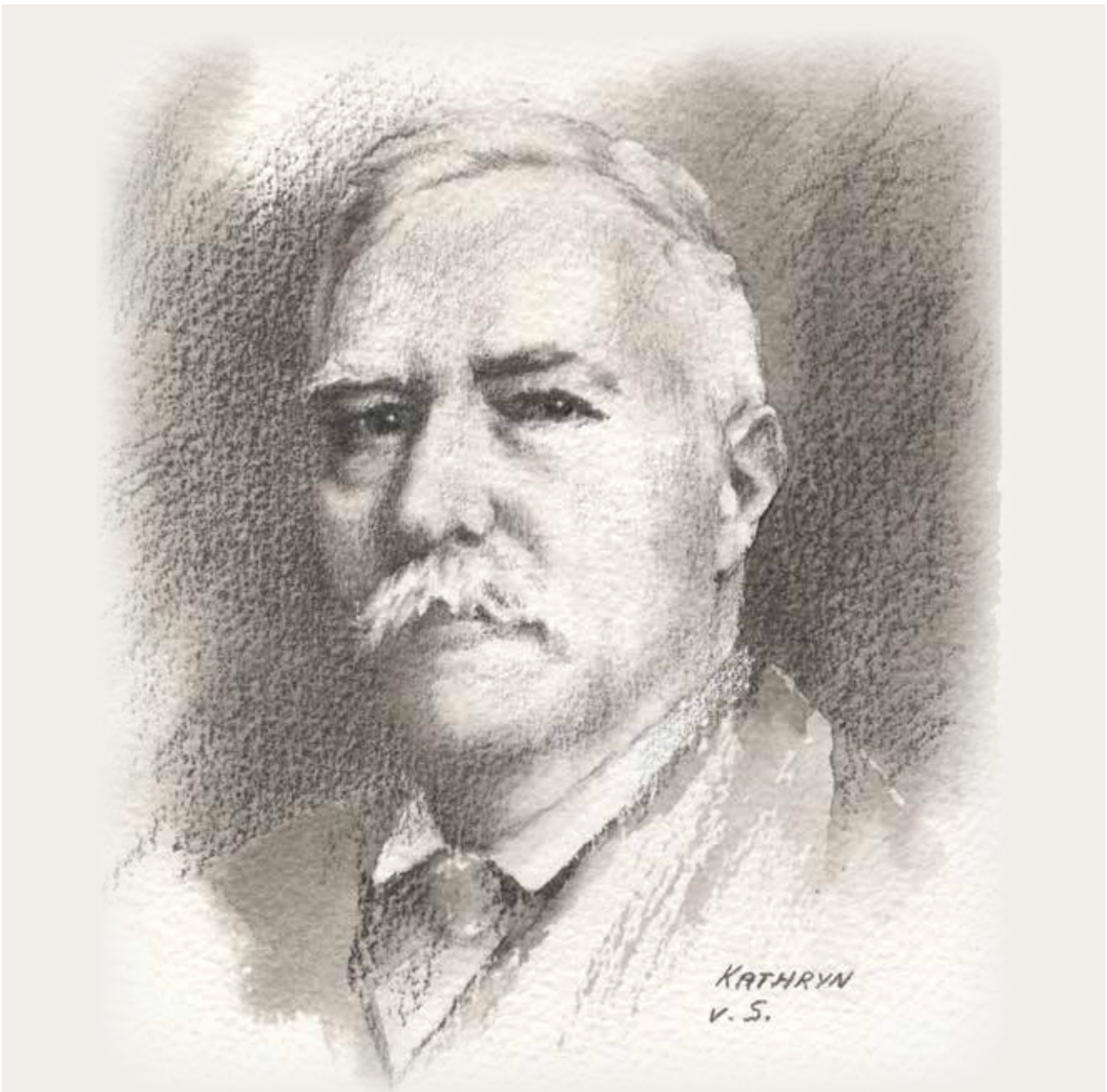
It is just not possible to describe a feeling of delight when glimpsed the dark shaded void of **BARNARD 33** coming in and out of view with averted vision against the glow of IC 434. Tim Cooper, whom I've been sharing deep sky objects, comets and meteors since early days, was visiting at the time. Needless to say, I introduced the elusive Horse Head Nebula with great fanfare to him, waiting anxiously to share in the joy when he at last acknowledged the sighting of this wonderful rare object.



BARNARD 33 – Dark Nebula – Photograph: Dieter Willasch

Each October, Orion is home to one of the more reliable meteor showers. The Orionids are one of two meteor streams spawned by comet 1P/Halley, and represent the inbound portion of the debris stream in its orbit. On the night of maximum activity, usually around October 21, the observer can expect to see up to 30 fast and often bright meteors per hour, emanating from near Orion's club. With a broad maximum the activity can remain nearly as high for a few days centred on this date. Like their sister meteors, the eta Aquarids, bright Orionids often leave trains in their wake and the observer prepared to watch after midnight is rewarded with a fine display each year (Tim Cooper).

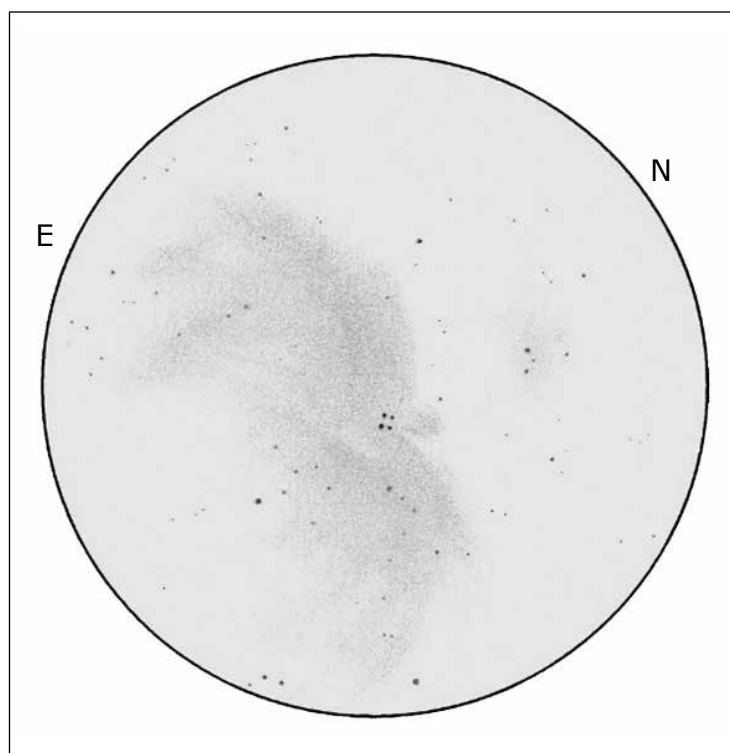
Astronomy friends, seek out Orion's friendship; the Mighty Hunter has a great deal to offer.



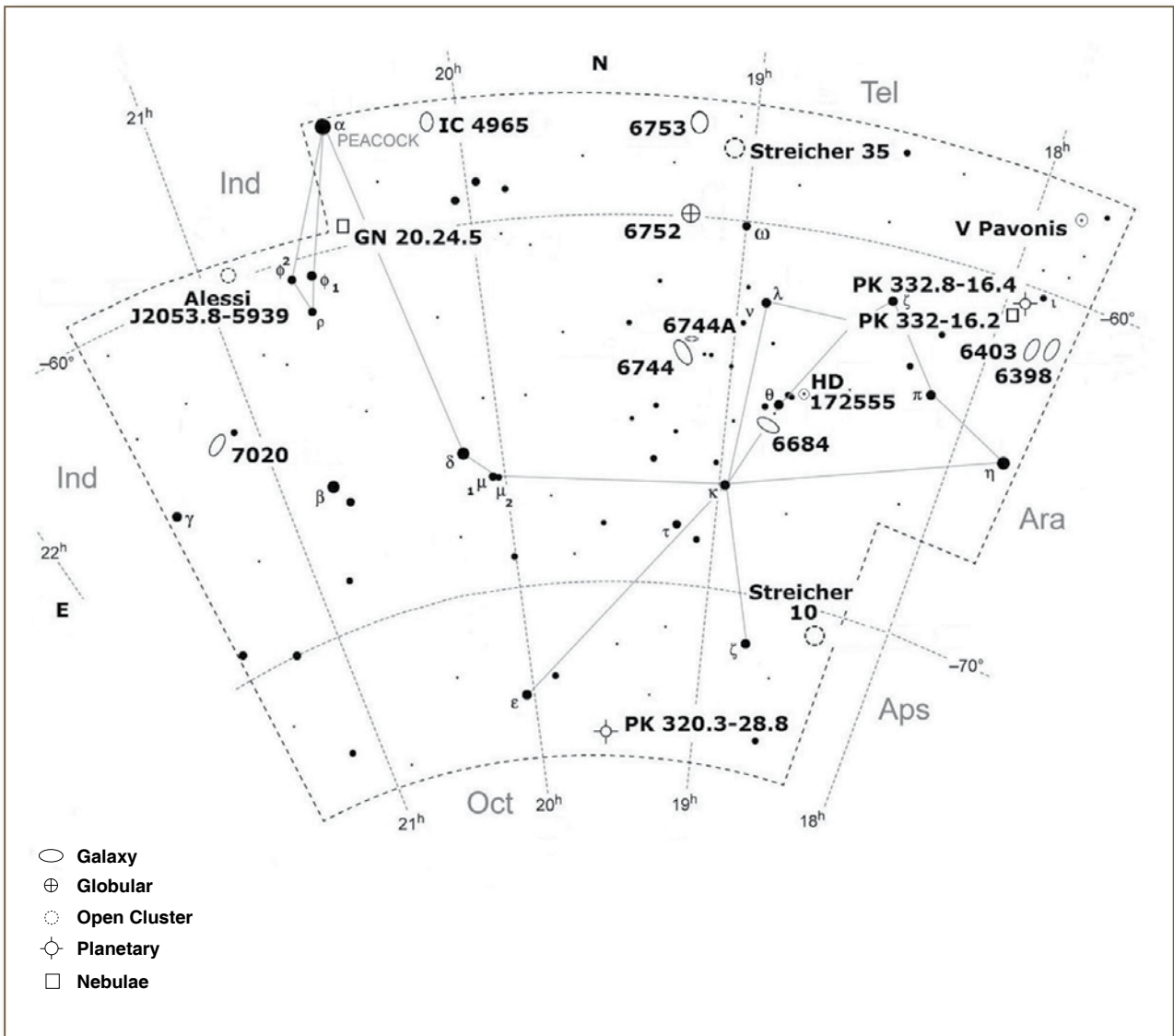
Edward Emerson Barnard – Pencil Sketch: Kathryn van Schalkwyk

Edward Emerson Barnard (1857–1923) working at Mount Wilson Observatory California used wide-field lenses and the 24-inch Bruce telescope to take superb photographs of the Milky Way. They showed dark cloud structures, rifts and holes where there were only few stars visible. He discovered more than 300 dark nebulae. Barnard compiled a catalogue of the more prominent dark clouds, called Atlas of Selected Regions of the Milky Way, which was published in 1927. He died on 6 February 1923 in Williams Bay and was buried at Mount Olivet Cemetery in Nashville.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1762	Galaxy	05h03m.6	+01°34'.3	12.6	1.6'×1'
NGC 1976 Messier 42	Emission Nebula	05h35m.3	-05°27'.0	3.7	20'×15'
NGC 1982 Messier 43	Emission Nebula	05h35m.6	-05°16'.0	4	15'×10'
NGC 1999	Reflecting Nebula	05h36m.5	-06°42'.2	5	2'×2'
BARNARD 33	Dark Nebula	05h40m.9	-02°28'.0	-	4'
IC 434	Emission Nebula	05h41m.0	-02°24'.0	-	55'×10'
NGC 2024	Emission Nebula	05h41m.7	-01°51'.1	5	30'
NGC 2022	Planetary Nebula	05h42m.1	+09°05'.0	11.9	18"
NGC 2068 Messier 78	Reflecting Nebula	05h46m.7	+00°03'.0	5	8'×6'
NGC 2112	Open Cluster	05h53m.8	+00°24'.0	8.4	11'
NGC 2169	Open Cluster	06h08m.4	+13°57'.0	5.9	6'
NGC 2180	Open Cluster	06h09m.6	+04°42'.7	9	6'



NGC 1976 – M42 – my humble sketch of the Great Orion Nebula



The constellation of Pavo

PAVO

A Fanciful Bird

It isn't difficult to see why a constellation would have been named after one of the most colourful land birds we know. Astronomers of old must have regarded the dance and showy, extravagant display of the Peacock as something quite special, hence the place of honour it occupies in the starry night skies. The constellation Pavo the Peacock can be seen flying south of the constellations Sagittarius and the Southern Crown. The bird itself, long a symbol of immortality, does not fail to show off its true colours in spreading its tail for all to see. However, the brighter stars in this constellation closely resemble the shape of a peacock.



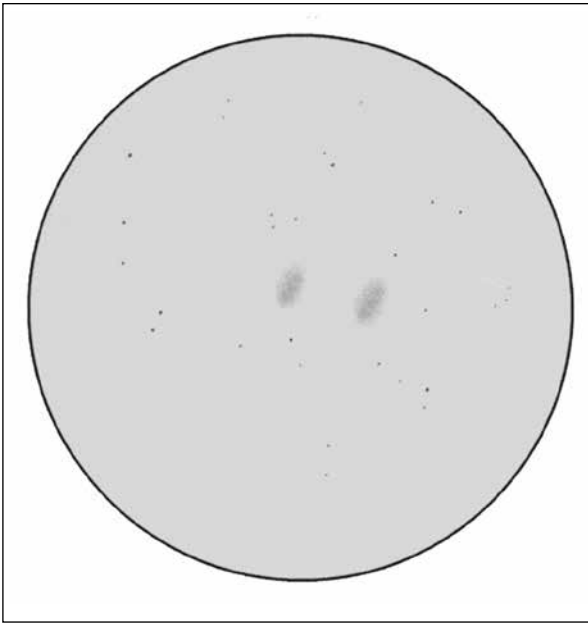
Dutch navigators Pieter Dirkzsoon Keyser and Frederick de Houtman introduced a dozen new constellations while mapping the southern sky at the close of the 16th century, and included Pavo as one of them.

The constellation houses a multitude of bright stars, with alpha Pavonis at magnitude 1.9 appearing as the bird's bright eye. Peacock, the name for alpha Pavonis, is a star that officially bears the same name as the constellation in which it is situated. It is a hot blue-white star about 200 light-years distant, and spectra show that the star has an unseen companion that revolves around it every 12 days. The feathery tips are projected by the magnitude 3.5 eta Pavonis and magnitude 4.2 lambda Pavonis towards the western part of the constellation.



Pieter Dirkzsoon Keyser and Frederick de Houtman

The blood red variable star V Pavonis, which is situated in the far north-western corner of the constellation, suggests perhaps one of Pavo's beautiful red feathers. The star is a red semi-irregular that varies between magnitudes 9.3 to 11.2 in brightness over a period of 225 days.



NGC 6403 and NGC 6398 – Galaxies

Pavo is dotted with more galaxies than it probably has to offer in spots on its feathery outfit. **NGC 6403** and **NGC 6398**, a pair of galaxies is situated along the western border of the constellation very close to each other in an east-west position. This couple could well pass for twins, although NGC 6398 is a tad bigger. They display similar hazy ovals in a north-south direction, the one just like the other.



PK 332.8-16.4 and PK 332-16.2
Photograph: DSS

Some planetary nebulae can be pretty faint and **PK 332.8-16.4** is no exception. It is situated only 1.6 degrees north-east of the pair of galaxies mentioned above. A systematic close search of the star field only just reveals the planetary as a very faint out-of-focus spot, very close to a star on its southern end (top area of the photograph).

Equally faint and challenging is the very small diffuse nebula **PK 332-16.2**, situated only 30' south of the elusive planetary nebula mentioned above. Filters will perhaps be your best tool

to corner this nebula, which is barely visible among the stars (lower area of photograph).

Pavo also holds in its feathers a Cepheid variable star, with kappa Pavonis sitting more or less in the middle of the constellation. The star varies in brightness from magnitude 3.9 to 4.7 and back during a 9-day period. All Cepheid variable stars of a given type that vary at a specific rate have the same inherent brightness.

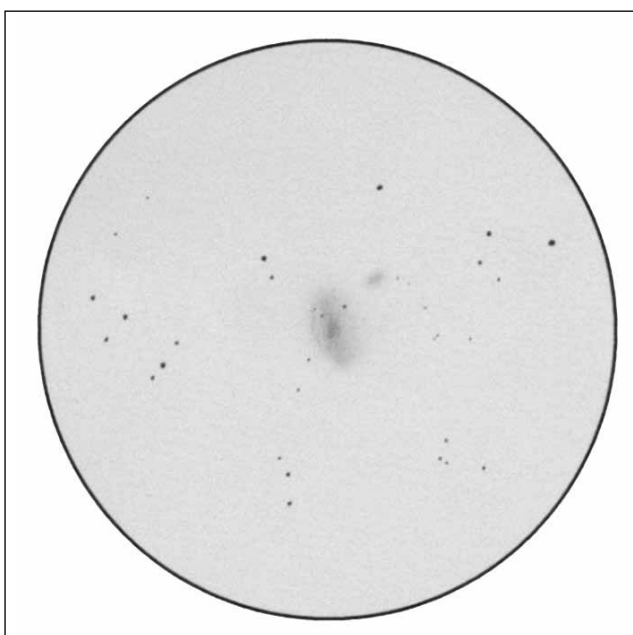
Asterisms in various forms are among the most interesting groupings, and searching for them in the star field will reward you over and over again. I was fortunate enough to come across a star string straddling the boundary between the constellations Pavo and Apus.

STREICHER 10 consists of eight stars snugly together in a star field crowded with galaxies. The beautiful white magnitude 6.7-star HD 165861 marks the south-western end of the string with seven fainter stars extending towards the north-east. The stars in the centre area are somewhat fainter, but globally seen, this uneven string is well defined against the background star field.

Use theta Pavonis as reference to another galaxy 2.6 north-east. This area is galaxy territory par excellence – they appear like fleas on Pavo's back. Nevertheless, **NGC 6744**, also known as Bennett 120 is one of the largest barred-type spirals known. It is an outstanding, easily seen oval-shaped galaxy in a north-east to south-west direction. The outer edge appears misty, with a few faint stars on the galaxy's dusty surface. The nucleus is quite small and displays a hazy envelope, slightly oval in shape. Astronomers have detected several young massive star clusters in NGC 6744 that could have formed recently. **NGC 6744A** is a small lenticular galaxy situated on the north-western rim of NGC 6744. The star field is quite pretty, displaying a few lovely short strings of faint stars.



STREICHER 10 – Asterism
Photograph: DSS



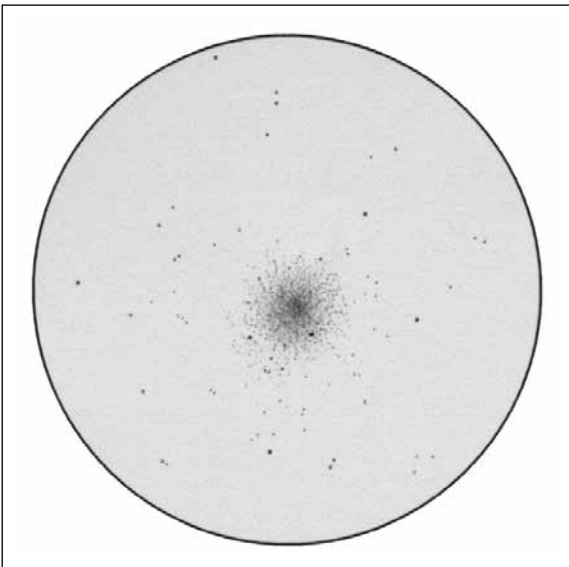
NGC 6744 and NGC 6744A – Galaxies



NGC 6684 – Photograph: phys.ttu.edu

One of the many galaxies in Pavo is **NGC 6684**, situated only 6' south of magnitude 5.7 theta Pavonis towards the centre of the constellation. Although close to such a bright star it is easily seen as a round to oval haze, brightening to an almost stellar nucleus. It is advisable to position theta Pavonis outside the field of view to achieve a better glimpse of the galaxy. A magnitude 9.5 star could be the reference point situated between theta Pavonis and the galaxy.

The Spitzer Space Telescope has seen the aftermath of a high-speed collision that occurred in the past few thousand years between two young rocky planets that occurred around the young star HD 172555, barely 24' north-west of theta Pavonis. The star is believed to be 95 light-years away.



NGC 6752 – Globular Cluster

Pavo does not disappoint with its variety of deep sky objects appearing to decorate the starry bird's feathers. A somewhat lone globular cluster is situated in a field strewn with galaxies 1.6 degrees east of the magnitude 5-star omega Pavonis. **NGC 6752**, also known by its nickname the Starfish, is the showpiece of the constellation. James Dunlop discovered this globular cluster in 1826, at Paramatta Observatory, Australia. The globular cluster which is estimated to be 13 000 light-years distant, appears as a tight, well-resolved star-rich cluster with a small, bright condensed core. The stars run out

in trails and loops which spread out into the field of view. Higher magnification shows the core turned slightly oblong with very faint stars spouting out like a fountain. An eye-catching magnitude 6.7 star can be seen embedded in the southern outskirts of the globular, with a few orange coloured members in the middle part. Auke Slotegraaf has this to say about NGC 6752: "The cluster is best observed slowly, letting your eye play with the shapes that the stars seem to trace out across the face of this globular." He describes the nucleus as banana-shaped. The open cluster Messier 38 in the constellation Auriga has also been nicknamed Starfish.

Regular investigation of star forms has been rewarded in the *Deep Sky Hunters* Catalogue, with **STREICHER 35** situated 2.2 degrees further north of the globular cluster NGC 6752. Prominent against the star field is a half-moon shape consisting of five stars, with the brightest member the magnitude 6-star HD 176522 on the southern tip. The open side of the half-moon, facing north-east, appears to be filled with a handful of faint splinter stars.



STREICHER 35 – Photograph: DSS

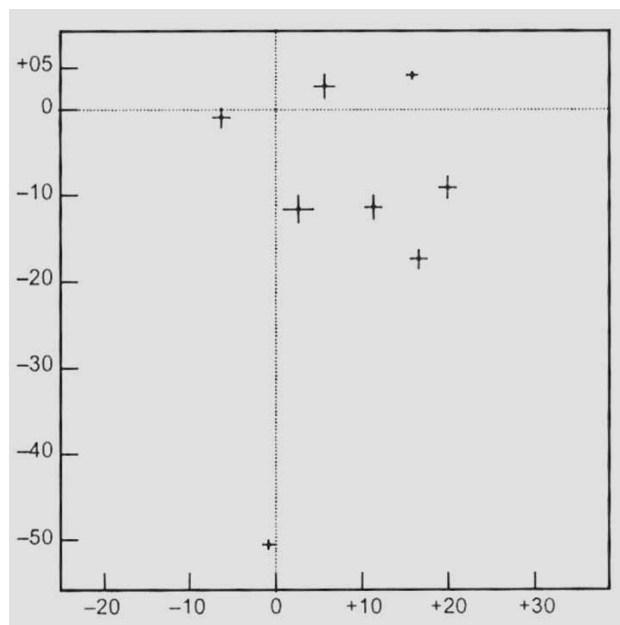


Diagram – Auke Slotegraaf

The Vector-point for the eight brightest stars in this asterism can be seen in the diagram provided by Auke Slotegraaf. The abscissa shows proper measured in milli arc-seconds per year while the ordinate plots proper motion times in declination. The diagram indicates the proper motion of the stars to be in different directions through space.

The galaxy **NGC 6753** is situated only 1.4 degrees further north from the asterism. It is a relatively bright, oval star city with an outstanding bright nucleus. The companion elongated galaxy IC 4826 can be glimpsed 12' south.

Riding on the back of the Peacock is delta Pavonis, an intriguing magnitude 3.5 naked-eye star, at a distance of 19.9 light-years, one of the closest single sun-like stars. Only 4.7' south-east of delta Pavonis is a peculiar interacting pair of galaxies, called McLeish's Object. It is of 15 magnitude and was found by David McLeish at Córdoba Observatory in 1946.



Harlow Shapley – Pencil Sketch: Kathryn van Schalkwyk

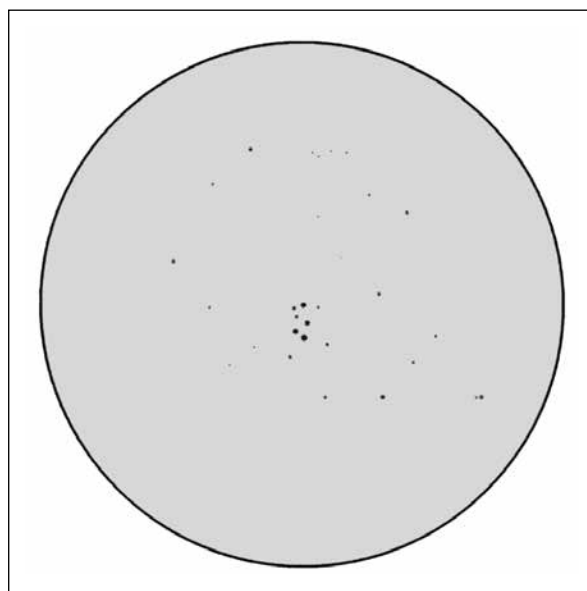
Harlow Shapley was born in Nashville, Tennessee, on 2 November 1885. He was offered the directorship at Harvard as the position was left vacant in 1921 after the death of William Pickering. Shapley studied globular clusters, and their distribution with plates taken with the 25-cm Metcalf telescope at Mount Wilson Observatory in order to locate the geometrically centre of our galaxy. Henrietta Swan Leavitt discovered that for any two Cepheid variable stars with the same period of variation, the one with the brighter average magnitude will be closer to us. Shapley died in Boulder, Colorado, on 20 October 1972.

The galaxy **IC 4965** is situated in the far north-east on the boundary between Pavo and Telescopium and displays a very faint puff of haze, barely seen, with a slightly brighter nucleus. The galaxy is only 1.8 degrees west of alpha Pavonis, who keeping also a watchful eye on the Shapley Super Galaxy Cluster which is a high-density region apart from the Norma cluster of galaxies. The large mass discrepancies associated with rich galaxy clusters were greatly alleviated, but not fully explained, by the discovery of hot, x-ray emitting gas in these clusters.



IC 4965 – Photograph: In-The-Sky

ALESSI J2053.8-5939 is situated on the northern boundary between the constellations Pavo and Indus. What a beautiful, exceptional grouping. The brightest member is the magnitude 7.5 white coloured star HD 198534 situated towards the south of this lovely small group of seven stars.



ALESSI J2053.8-5939 – Asterism



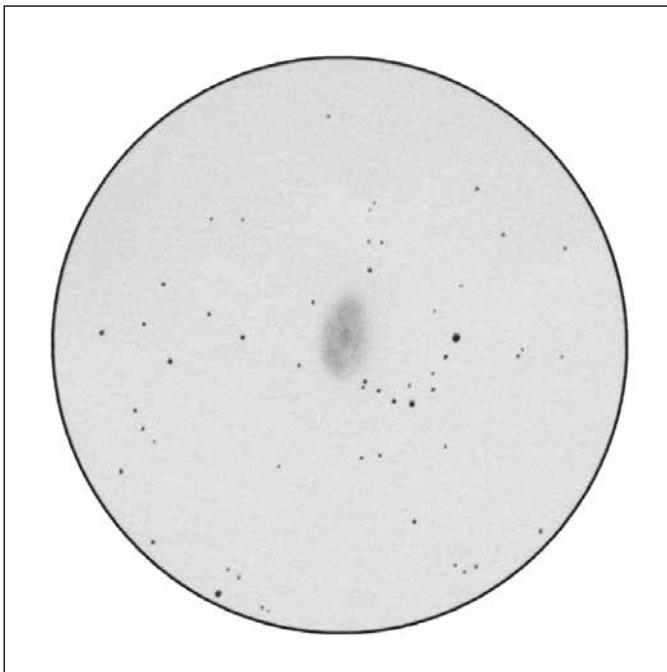
Bruno Alessi from the Sao Paulo State University is searching for unknown clusters and elusive planetary nebulae.

Halfway between alpha and phi Pavonis is the diffuse nebula, **GN 20.24.5**, around 4' in size and a little easier to detect. Once again, filters are the best tool to discern this kind of nebulae.



PK 320.3-28.8 – Photograph: DSS

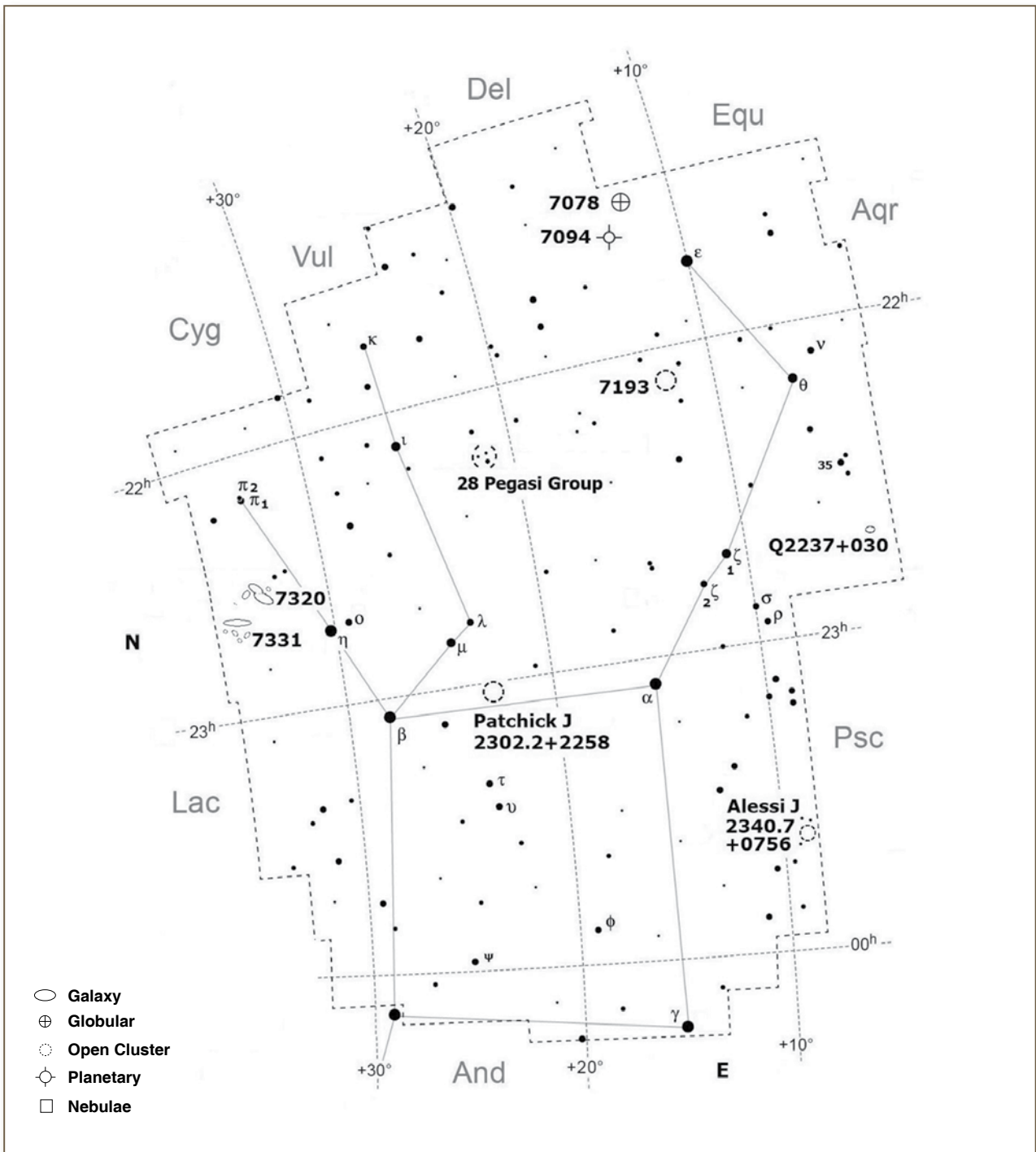
In the southern extreme of the constellation Karl Henize discovered the planetary nebula **PK320.3-28.8** situated 2.4 south-west of epsilon Pavonis and a few arc-minutes from the boundary with the constellation Octans. Averted vision is the best way of discerning the planetary nebula's hazy appearance. In this photograph a very faint galaxy can just be spotted between the few bright stars immediately east of the planetary nebula.



NGC 7020 – Galaxy

While we are in galaxy country: another special galaxy is situated in the far eastern part of the constellation. **NGC 7020** is a ring-type galaxy resembling a hazy cotton ball, with a bright small nucleus. It is situated only 2 degrees north-west of magnitude 4.2 gamma Pavonis. Higher magnification turns the roundish shape almost into a north-south oblong. The galaxy is believed to be 150 million light-years distant. The star field towards the west provides for interesting character, with a chain of faint stars that connect a magnitude 8 star and the galaxy to each other, just like the old pocket watches with a gold chain attached.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6398	Galaxy	17h42m.7	-61°41'.7	13.4	2'×1.7'
V Pavonis	Red Semi-Variable Star	17h43m.3	-57°43'.4	9.3 11.2	225 days
NGC 6403	Galaxy	17h43m.4	-61°40'.8	13.5	1.1'×1.2'
PK 332.8-16.4	Planetary Nebula	17h47m.3	-60°22'.6	14	36"
PK 332-16.2	Diffuse Nebula	17h54m.4	-60°49'.5	14.5	1'
STREICHER 10 DSH J1815.3-7042	Asterism	18h15m.3	-70°42'.5	5.5	12'
NGC 6684	Galaxy	18h48m.8	-65°10'.4	10.4	4.5'×3.3'
STREICHER 35 DSH J1903.7-5749	Asterism	19h03m.7	-57°49'.5	8	19'
NGC 6744A	Galaxy	19h08m.7	-63°43'.8	14	1×8'×0.7'
NGC 6744	Galaxy	19h09m.8	-63°51'.4	8.6	13.5'×10'
NGC 6752	Globular Cluster	19h10m.9	-59°58'.9	5.4	20.4'
NGC 6753	Galaxy	19h11m.4	-57°03'.0	11.1	2.9'×2.5'
PK 320.3-28.8	Planetary Nebula	19h33m.8	-74°32'.5	13	10"
IC 4965	Galaxy	20h12m.5	-56°49'.6	14	1.1'×1'
GN 20.24.5	Reflection Nebula	20h28m.5	-59°14'.5	-	4'
ALESSI DSH J2053.8-5939	Asterism	20h53m.8	-59°39'.5	9.1	7'×3'
NGC 7020	Galaxy	21h11m.3	-64°01'.5	11.8	3.8'×1.7'



The constellation of Pegasus

PEGASUS

A Horse with Wings

Who among us is not familiar with the yet far-northern Pegasus constellation with its very clear square shape and, as a bonus, also appears fairly large? The constellation is very popular, especially with amateur astronomers who observe the depth of its deep sky objects. To search this large constellation takes care and determination to study it thoroughly. In mythology Pegasus was the son of Neptune and Medusa who at his father's command leapt into the sea. He seems, however, to have come back to earth again with wings.

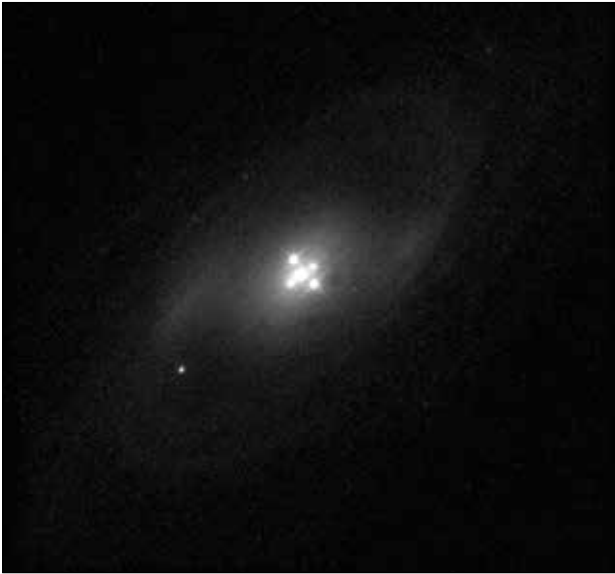


NGC 7078 – M15 – Photograph: NASA

Perhaps one of the most beautiful objects, is the globular cluster **NGC 7078**, also known as Messier 15, which can be found located proudly at the horse's muzzle, almost as if it were a delicacy being offered to it. M15 is amazingly outstanding against the background star field situated 3 degrees west of the magnitude 2.3 epsilon Pegasi and was discovered by Jean-Dominique Maraldi in September 1746. It is large and bright and displays many faint stars that almost give a three-dimensional impression. What strikes one is the very bright centre that almost works itself up to an inner pin-prick core. Many faint stars in strings on the periphery intermingle with one another. M15 also host a planetary nebula, situated inside the globular cluster on the northern edge of the inner core. Pease 1, also known as PK 065.0-27.3, was detected in 1928 by Francis G. Pease and is one of only four planetary nebulae known to exist within a globular cluster.

A further 2 degrees north-east the very faint planetary nebula, **NGC 7094**, can be spotted. It has all the qualities of only a faint out-of-focus star, small in size and covered in haziness. It's not at all easy to sniff out these faint, small objects among similar-looking stars.

A delicate star grouping **NGC 7193**, is situated midway between magnitude 2.3 epsilon and magnitude 3.3 zeta Pegasi. The sprinkling of a dozen faint stars in this grouping is situated in an east-west direction. The galaxy IC 5160 is only 6' north of this lovely open cluster.



Q2237+030 – Photograph: Hubble

Pegasus also has in its midst some very unusual objects. One such is **Q2237+030**, a full 8 billion light-years away from us in the far southern corner of the constellation, but it is probably better known as Einstein's Cross or Huchra's Lens. A Hubble deep picture shows four images of a very distant quasar which has been multiple-imaged by a relatively nearby massive foreground object acting as a gravitational lens. The concept is difficult to understand, but this is in fact the edge of space and time as the great Albert Einstein predicted. Rather

do not even try to trace it, but you can admire the spot. My best attempt was spotting a faint double star of 10 magnitude about 8' to the east of Einstein's Cross. There are also three magnitude 9 stars in a string towards the southwest. The galaxies NGC 7360, 7367, 7373 and 7376 are situated less than a degree to the east of Q2237+030.

There is more to tell about Pegasus the Winged Horse constellation, with another object you might almost certainly not have seen revolving around the star HD 209458. A planet has been discovered known as HD 209458b around this star, surrounding it with controversy as it is not known whether it is a planet or a comet or both.

South of iota Pegasi is the star 28 Pegasi situated on the eastern edge of a star grouping. About a dozen various-magnitude stars covered in yellow, white and orange jackets, are quite outstanding in combination with the magnitude 6.6 super-white coloured 28 Pegasi. So, it is appropriate to call this grouping of stars the **28 PEGASI GROUP**.

An asterism was discovered by Dana Patchick in 1980 and named by his friend Steve Kufeld as Asterism Minor, but the correct indicated number is **PATCHICK J2302.2+2258**. This nice bright group can be found halfway between alpha and beta Pegasi on the border line with the star's tau, mu and lambda Pegasi in the near surroundings. It is a loose grouping easily seen through binoculars which appropriately displays perhaps a minor winged horse.

Another grouping **ALESSI J2340.7+0756** is situated close to the south-eastern border with Pisces and discovered by the well-known Amastro member Bruno Alessi. He had the ability to search out special groupings, most of the time outstanding against the star field. The mostly yellow and orange stars form a concave shape towards the west named also for its brightest star HD 222454. The group is situated just north of the dark nebula LBN 434.

Perhaps the best-known group of galaxies situated very close to the northern border with Lacerta is **NGC 7320** (Arp 319) and its members. Édouard Jean-Marie Stephan (1837–1923) was a French astronomer who discovered this group, but at the time was not aware of its nature. Known as Stephan's Quintet it is a staggering 300 million light-years away from us. NGC 7320 and its members is a challenge to select, so one needs time, dark skies, a relatively large telescope and a lot of patience, and perhaps confidence too. But to study groups like this is well worth the effort and very satisfying when bagging some of these faint galaxies.



Édouard Jean-Marie Stephan
Sketch: Kathryn van Schalkwyk



NGC 7320 ext. – Photograph: NASA

NGC 7320 is the largest of the group, which could be a foreground galaxy. It is situated on the southern edge of the group and appears as a hazy oval with a slightly brighter core and a magnitude 14 star superimposed on its south-eastern edge. With averted vision, an elongated faint nebula roughly east-west opposite and to the north-west marks the combined interacting light of galaxies NGC 7318 and NGC 7318A. With higher power the nebula split by two bright star-like points, indicated the

nuclei of these two galaxies. With care and concentration, NGC 7319 shows up as a haze with a low surface brightness just north of NGC 7320. Hanging on the south-western edge of the group is NGC 7317. It has the appearance of two fuzzy stars thanks to a magnitude 13 star at the western edge just 16" from the nucleus. The entire group is crammed into a circle of less than 4'. The odd-one-out member is NGC 7320c, which can be spotted a few arc-minutes off to the north-east of this tight group. It is the most crowded of all the Hickson compact group of galaxies, and it is unbelievable that all of them will fit into our Milky Way galaxy. With patience one can be rewarded with a successful attempt at viewing the Quintet. A huge intergalactic shock wave shown by the magnificent green arc in the Hubble picture is the effect produced by one galaxy falling into another at millions of miles per hour. As NGC 7318 collides with NGC 7318A, gas spreads throughout the cluster, atoms of hydrogen are heated in the shock wave, producing the green glow. The molecular hydrogen is one of the most turbulent forms ever seen. This phenomenon was discovered by an international team of scientists at the Max Planck Institute for Nuclear Physics (MPIK) in Heidelberg, Germany. Most notable is the fact that this collision can help provide a view into what happened in the early universe billions of years ago when it formed.

If this sounds like too much of a challenge and one that you do not feel like taking on with strength and admiration, then there is another group of galaxies just half a degree further north, **NGC 7331** and its members is known as the Deer Lick group of galaxies. Tom Lorenzin bestowed the common name on this galaxy group to honour the Deer Lick Gap, which lies in the mountains of North Carolina. Another possibility is that it is because numerous small galaxies hover close together like deer clustered around a salt lake. To describe the group in more detail: NGC 7331 is a large angled spiral, elongation north-south and relatively easy to glimpse through an ordinary medium size amateur telescope. Closer investigation reveals faint knotted areas on the surface with a much brighter oval-shaped nucleus. On the hazy north-western tip of the galaxy two faint stars can be glimpsed with careful observation and can easily be mistaken for possible supernova explosions. NGC 7335 is situated close on the north-eastern rim of NGC 7331. Only 2' further north the small galaxy NGC 7336 could at best be only another fleck of light. Two more galaxies, NGC 7337 and NGC 7340, are situated slightly further east and south-east.



NGC 7331 ext. – Photograph: NASA

A surprise was discovered in the star field between Stephan's Quintet and the Deer Lick group of galaxies. Stephen O'Meara spotted a string of tight stars almost halfway between these two compact groups of galaxies. He characterized this handful of faint stars as "fleas" surrounding the group of deer! This grouping is also listed in the Deep Sky Hunters catalogue as **GRACZEWSKI 1**.



NGC 7331 galaxy group at the top, and NGC 7320 galaxy group at the bottom with the tight asterism GRAZEWSKI 1 halfway between them.

Photograph: Astrocat



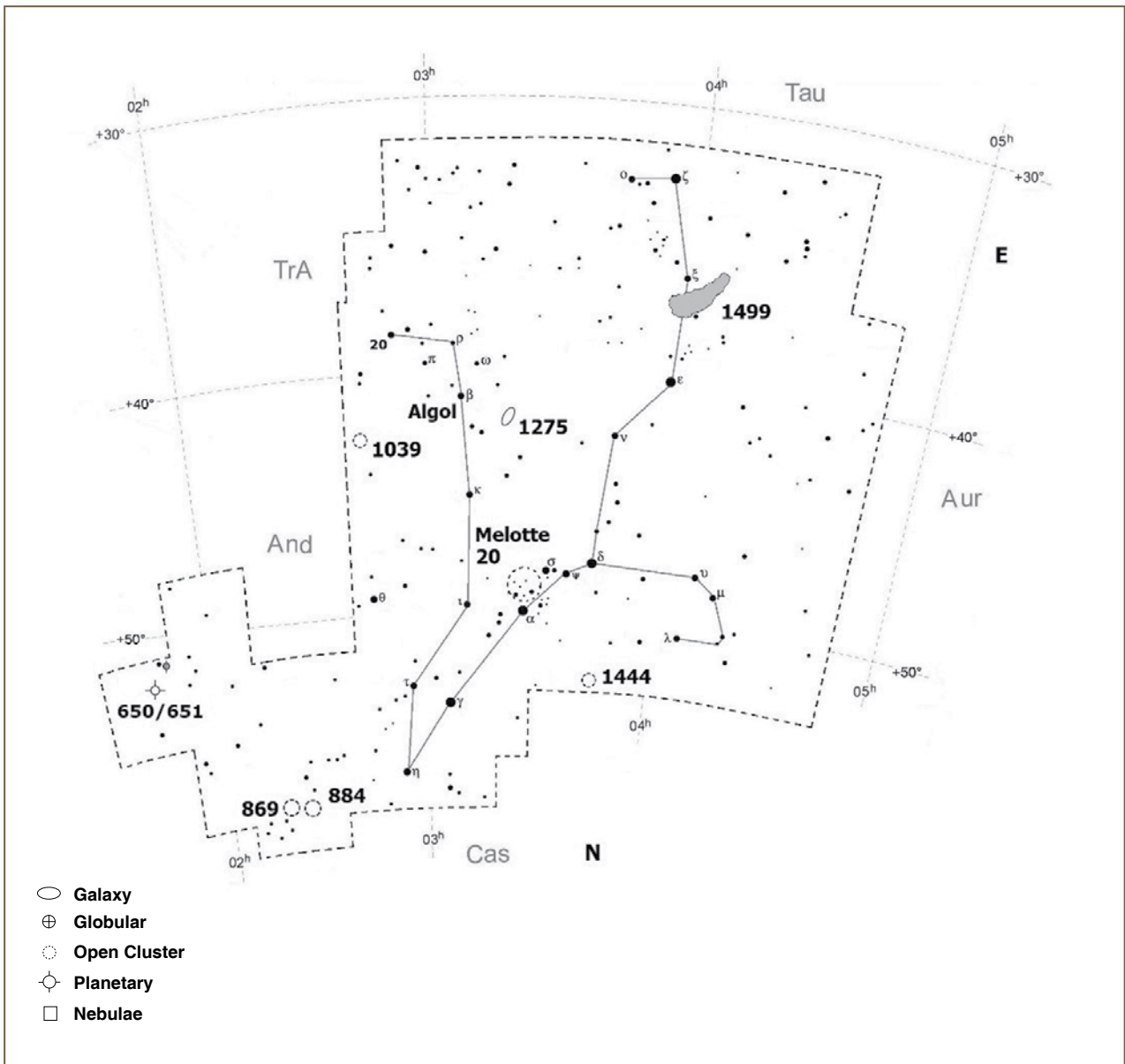
Stephen James O'Meara, author of several highly-acclaimed books, is well known among the astronomical community for his engaging and informative writing style. He was the first person to sight Halley's comet on its return in 1985 and the first to determine visually the rotation period of planet Uranus. Asteroid 3637 was named O'Meara in his honour by the International Astronomical Union.

Stephen James O'Meara
Photograph: RASC Edmonton

Only three of the four bright stars popularly known as the Square of Pegasus are part and parcel of the constellation. The north-eastern corner star is alpha Andromedae situated virtually on the border line of the two constellations. It would be nice if Pegasus could claim all four corner stars for its constellation.

Fly with this sky-figure horse through the depths of the universe and explore these fascinating objects that the constellation Pegasus has to offer.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 7078 Messier 15	Globular Cluster	21h29m.8	+12°10'.2"	6.2	12.3'
NGC 7094	Planetary Nebula	21h36m.8	+12°47'.2"	13	158"
NGC 7193	Open Cluster	22h02m.9	+10°48'.3"	10.2	12'
28 Pegasi Group	Open Cluster	22h10m.5	+21°03'.0"	9	14'
NGC 7317	Galaxy	22h35m.9	+33°56'.8"	13.6	0.5'×0.5'
NGC 7318	Galaxy	22h35m.9	+33°57'.8"	13.4	0.9'×0.9'
NGC 7318A	Galaxy	22h35m.8	+33°57'.5"	13.3	1.6'×1.2'
NGC 7319	Galaxy	22h36m.3	+33°58'.7"	13	1.5'×1.1'
NGC 7320C	Galaxy	22h36m.3	+33°59'.1"	16.6	0.4'×0.4'
NGC 7320	Galaxy	22h36m.0	+33°57'.1"	12.6	1.7'×0.9'
NGC 7331	Galaxy	22h37m.1	+34°25'.3"	9.5	10.5'×3.7'
NGC 7335	Galaxy	22h37m.3	+34°27'.3"	13.3	1.3'×0.6'
NGC 7336,	Galaxy	22h37m.2	+34°29'.0"	14.7	0.5'×0.4'
NGC 7337	Galaxy	22h37m.4	+34°22'.0"	14.4	1.1'×0.9'
NGC 7340	Galaxy	22h37m.6	+34°25'.8"	13.7	0.9'×0.6'
Q2237+0305	Galaxy	22h40m.5	+03°21'.5"	16.5	2'
PATCHICK DSH J2302.2+2258	Asterism	23h02m.2	+22°57'.5"	8.3	22'
ALESSI DSH J2340.7+0756	Asterism	23h40m.7	+07°56'.4"	8	14'×4'



The constellation of Perseus

PERSEUS

Perseus the Young Man

Perseus was in ancient times known as a champion for various reasons. One of the images of him is that of a young man wearing a piece of cloth around his body, perhaps showing off and wanting to impress the Pleiades women towards the south. Perseus is one of the largest constellations between Andromeda and Auriga with Taurus towards the south. This stellar young man has quite a variety of open clusters to offer, with a very intriguing star in among them.



The double cluster **NGC 869** and **NGC 884** are possibly among the most outstanding and discussed objects to have found their place in the constellation. Against a dark night sky, the open star clusters can be seen with the naked eye as two hazy objects situated cosily close together, just half a degree apart. NGC 869, the western twin, is much denser than the companion cluster NGC 884. Through an amateur telescope NGC 869 is outstanding and compact with stars seen dominating the centre part. The western part of NGC 869 contains bundles of faint stars which extend the cluster, making it slightly larger than NGC 884. These are two very young clusters with NGC 884 slightly further away than NGC 869. Companion cluster NGC 884 is slightly fainter, not so dense, slightly more spread out than NGC 869, although also bright and outstanding. The eastern side of NGC 884 is very busy with fainter stars than the sparse western side, with a broken middle core dividing it into two parts. NGC 884, has in its midst a few colourful stars on display which include the yellow coloured star RS Persei. Studying the groupings through an amateur telescope offers concentrations of fainter stars, dark lanes and elegant star strings that merge with stars in the field of view. According to the largest study ever made of the pair they really are twins and part of the Perseus OB1 association of young supergiant stars, about 7300 light-years away, formed from the same interstellar cloud of gas.

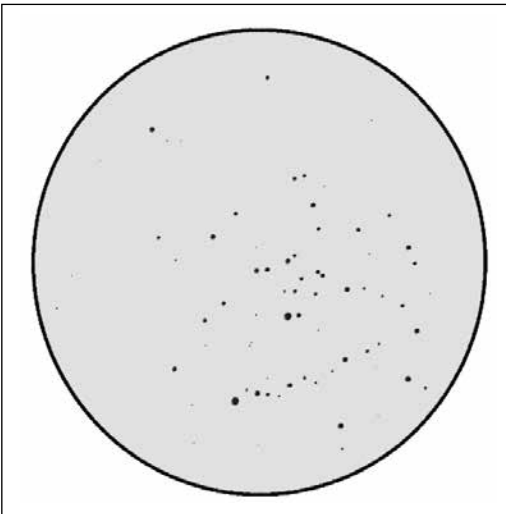
A beautiful area to explore is the cluster **MELOTTE 20**, which emphasises alpha Persei, a Type-F supergiant star and its surroundings in an excellent way. Several stars of this large cluster are spread out around and mostly south-east of alpha Persei. It is a nice target for binoculars, which will show fainter stars in loops and curls that fill the space between the brighter ones. This large cluster is bound together by gravity, similar in age and at a distance of about 600 light-years from us. A few tight stars inside the cluster immediately south of alpha Persei displays the shape of a grocery cart, if using one's imagination.



NGC 650 and NGC 651 – M76
Photograph: Messier objects

The planetary nebula **NGC 650/651**, situated close to the Andromeda border, is better known as Messier 76 or by its more popular names Little Dumbbell and Barbell, according to friends Kepple and Scanner. They are so called because they remind one strongly of Messier 27 in the constellation Vulpecula with a very strong similar appearance. The planetary was catalogued with two numbers because of the two separate lobes, which show excellent detail through a medium-sized amateur telescope. The elongated boxy nebula is seen without difficulty with the southwestern lobe slightly brighter.

NGC 1444 is a small, compact open cluster consisting of only a handful of stars surrounding the multiple star Struve 446. The focus of this group is obviously the bright deep yellow primary star, which contrasts with the cluster of fainter stars.



NGC 1039 – M34 – Open Cluster

Virtually on the border with Andromeda is a typical open cluster, **NGC 1039**, also known as Messier 34, which can be found situated in a triangle with beta and kappa Persei. With approximately 60 stars in its midst it is bright and outstanding against the background starfield. The cluster is not very compact, and seen as a whole it appears slightly square with faint stars forming circles and lines that flow into various patterns. The cluster centre is dominated by a few double stars, one of which is a deep yellow colour. It is about 1500 light-years distant and 200 million years old. Messier discovered the cluster in August 1764.

The strongest source of an extragalactic galaxy is **NGC 1275**, perhaps better known as Perseus A, situated 2 degrees east of beta Persei. The galaxy is the brightest and largest member of the Perseus I cluster of galaxies situated towards the middle area of this group. It is an erupted massive active Seyfert-type galaxy with a faint circular halo and the brightest radio source in the sky.

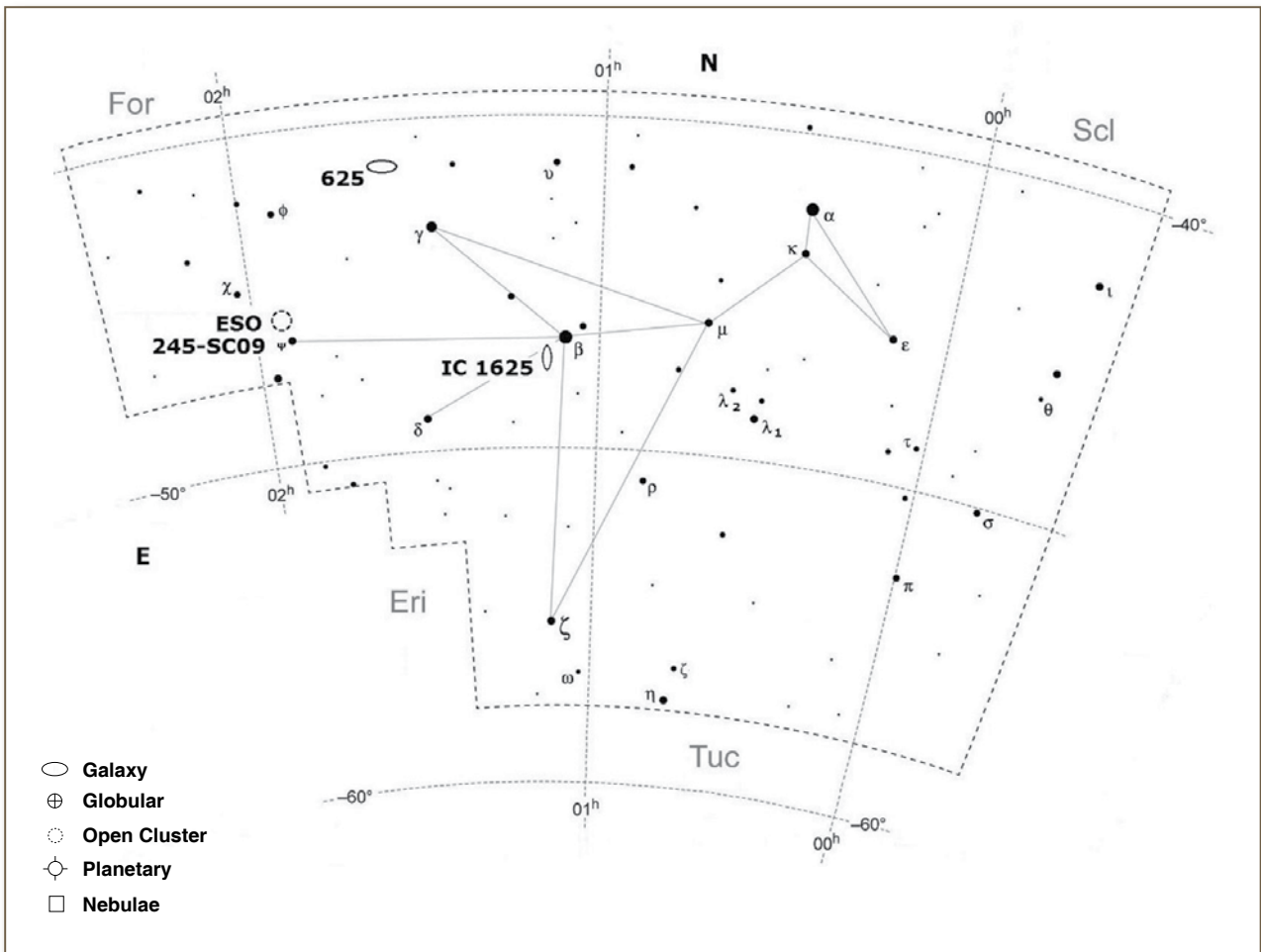
Interesting to know is that NGC 1233 were the first catalogued as unknown objects, now known as a galaxy, situated 23' east of omega Persei.

NGC 1499 is probably the most famous of all emission nebulae – at least in the northern hemisphere – not because it is bright, but rather for its shape, which resembles that of the state of California. The nebula is nearly 3 degrees long, and difficult to detect through a telescope, but beautifully seen through the eye of Hubble. The nebula is larger towards the western side with a more defined northern edge. The best option is to make use of filters which can bring out some of the brighter streaks inside the nebula.

Think of an eclipsing binary star and beta Persei, also known as Algol, immediately comes to mind as perhaps the most controversial star known to us. Its name, Demon Star, is very appropriate. It is a three-star system, consisting of beta Persei Aa1, Aa2, and Ab - in which the hot luminous primary Aa1 and the companion Aa2 regularly pass in front of each-other causing an eclipse, dropping to 30 percent of its original brightness. It dips to magnitude 3.4 every 2.86 days during the roughly main 10-hour-long partial eclipse hidden by the larger dimmer companion. Midway there is also a secondary eclipse (the second minimum) when the brighter primary occults the fainter unseen secondary, only detected photoelectrically. The star's altering brightness can be observed in the course of one night, hence the name Demon Star. In 1881, the Harvard astronomer Edward Charles Pickering presented evidence that beta Persei was actually an eclipsing binary, now known as Algol variable stars.

The dark night sky filled with its starry splendour is your best friend, even if all you see is faint fuzzies between the stars. The enthusiasm and effort alone bring timeless rewards and satisfaction.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 650 NGC 651 Messier 76	Planetary Nebula	01h42m.4	+51°34'.2	10.2	65"
NGC 869	Open Cluster	02h19m.0	+57°09'.0	5.3	29'
NGC 884	Open Cluster	02h22m.4	+57°07'.0	6.1	27'
NGC 1039 Messier 34	Open Cluster	02h42m.2	+42°47'.3	5.2	35'
NGC 1275	Galaxy	03h19m.8	+41°31'.3	11.8	3.2'×2.3'
MELOTTE 20	Open Cluster	03h22m.6	+48°36'.8	3	184'
NGC 1444	Open Cluster	03h49m.4	+52°40'.0	6.6	4'
NGC 1499	Nebula	04h00m.7	+36°37'.0	5.8	158'×40'



The constellation of Phoenix



A typical Horn Bill bird familiar in the South African bushveld

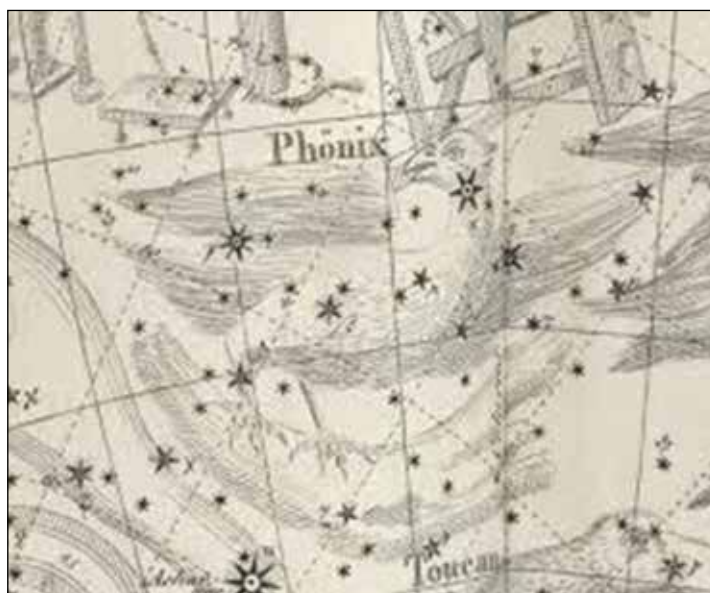
PHOENIX

The Fire Bird

The forefathers, seafarers and hunters of ancient times most probably developed names for the patterns and shapes outlined by the stars of the night sky. Many of them are associated with the legends of their cultures and their ways of life. Most of the constellations' names have Greek and Latin roots and some are very original. The Greek language refers to constellations as "signs", while Hipparchus, Ptolemy and the Arabians referred to them as "figures". It is generally accepted that various animals and birds played prominent roles in people's minds in ancient times as can be seen from images they have left us on wood and rocks.



Let us have a look at the starry bird constellations. Apus, also known as the bird of paradise, is without doubt one of the most appreciated feathered creatures. The ordinary turtle-dove received an honorary place in the star formation of the constellation Columba. Then there is Corvus the crow which literally lies equally astride the celestial equator. Grus the crane is surely one of the prettiest star constellations of the southern night sky. One of Bayer's twelve southern constellations is Pavo the peacock. Another starry bird which finds its place in the night sky is the constellation Tucana the toucan, also known as the beak bird. Flying to the northern hemisphere, we acquaint ourselves with the gracious constellation Cygnus the swan. Aquila the eagle is one of the best-known star-bird constellations projected against the northern night sky.



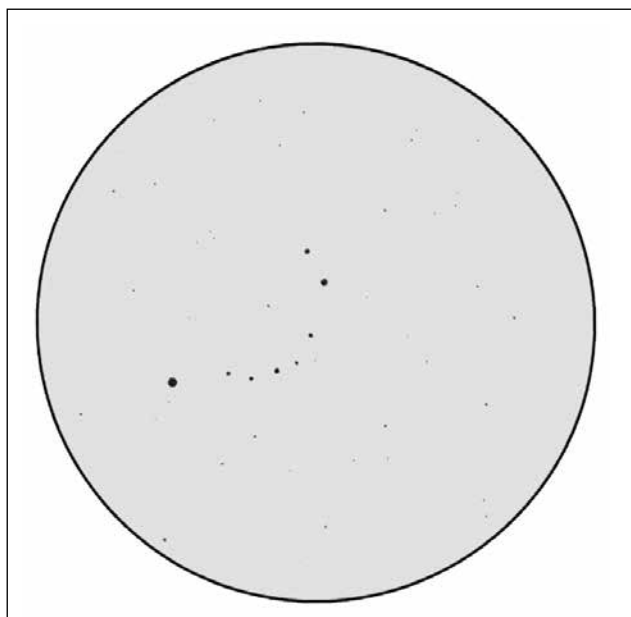
Ancient impression and map of the
Phoenix constellation
Photograph: The Skytonight

Phoenix is the winged bird shown on Egyptian coins as an emblem of immortality. Others saw the figure as a Griffin but in China it was known as the Fire Bird. The Arabian people knew it as a primitive boat and also called it the Young Ostrich. The constellation Phoenix is situated between Horologium and Grus, just south of the constellations Fornax and Sculptor.

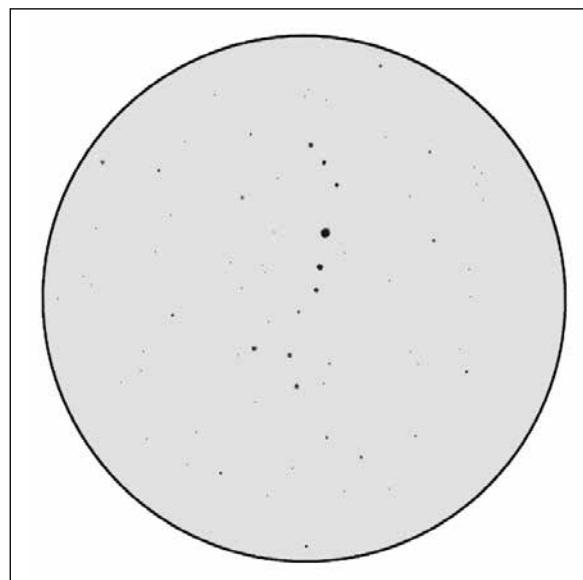
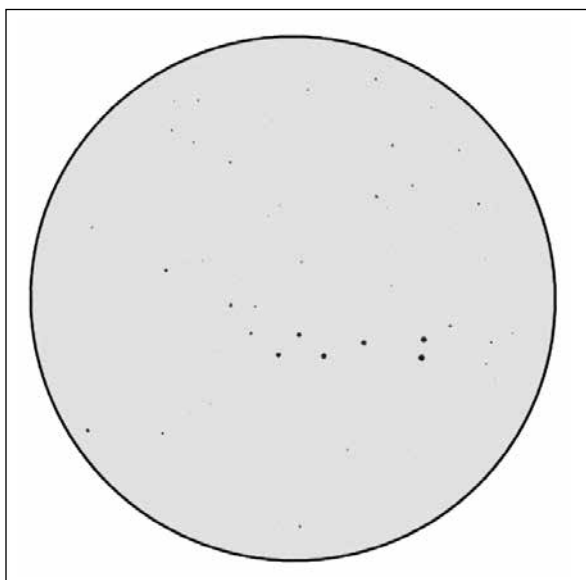
The double star theta Phoenicis is situated in the westernmost part of the constellation. It is comprised of two white coloured components, with magnitudes 6.6 and 7.2, a 4" separation and position angle (PA) of 275° . It was first documented by John Herschel in 1835.

Further to the east and comfortably situated in the centre of the constellation is beta Phoenicis. This beautiful, bright yellow coloured double star is only 1.4" in separation, with a position angle (PA) of 346° . The galaxy cluster Abell 2870 is on a radius of 55' to the east. The brightest in this group of galaxies is **IC 1625** with a magnitude of 12 and situated only 20' south-east of beta Phoenicis. It is slightly oval in shape with a tiny nucleus surrounded by a hazy envelope.

The north-eastern corner star of the constellation is illuminated by yellow coloured gamma Phoenicis, showing the way approximately 2.2 degrees north-east to the galaxy **NGC 625**. It displays a soft elongated east-west haze, which appears like an extended oval with a feather-like edge. Although it has a high surface brightness, a subtle brightening is evident towards the middle. With even higher magnification it seems that the western end of the galaxy is slightly thicker and blunt with a thinner, sharper eastern part. A quite prominent string of stars swings away from the galaxy in a southern direction.



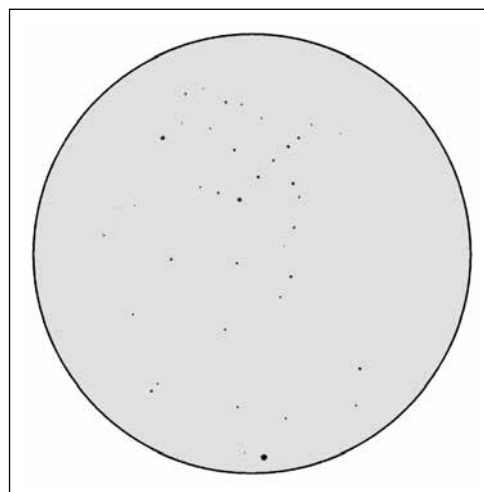
I keep on searching amongst the stars to find asterisms, and share this one approximately 40' south-east of pi Phoenicis. The stars in this formation represents in a way a pair of earphones, consisting of seven various magnitude stars in a halfmoon shape noticeably outstanding against the field of view. The brightest star is HD 12003 situated towards the east. It can be found at RA: 01h56m.0 – DEC: $-43^\circ06'.3$, with an overall magnitude of 11 and 13' in size.



Two more asterisms can be searched out in this feathery constellation at RA: 01h42m.5 – DEC: $-42^{\circ}12'.9$. and RA: 23h42m.2 – DEC: $-53^{\circ}23'.7$

To find a special kind of cluster in the constellation, you only have to shift your attention 18' north of psi Phoenicis towards the eastern part of the constellation.

ESO 245-SC09 enriches its direct surroundings in an outstanding way. Unique to this cluster is the long, faint north-west to south-east string approximately 10' in length. Fainter members spray out to the north-east. To me this cluster resembles a secretary bird with its long legs and outspread wings in flight.

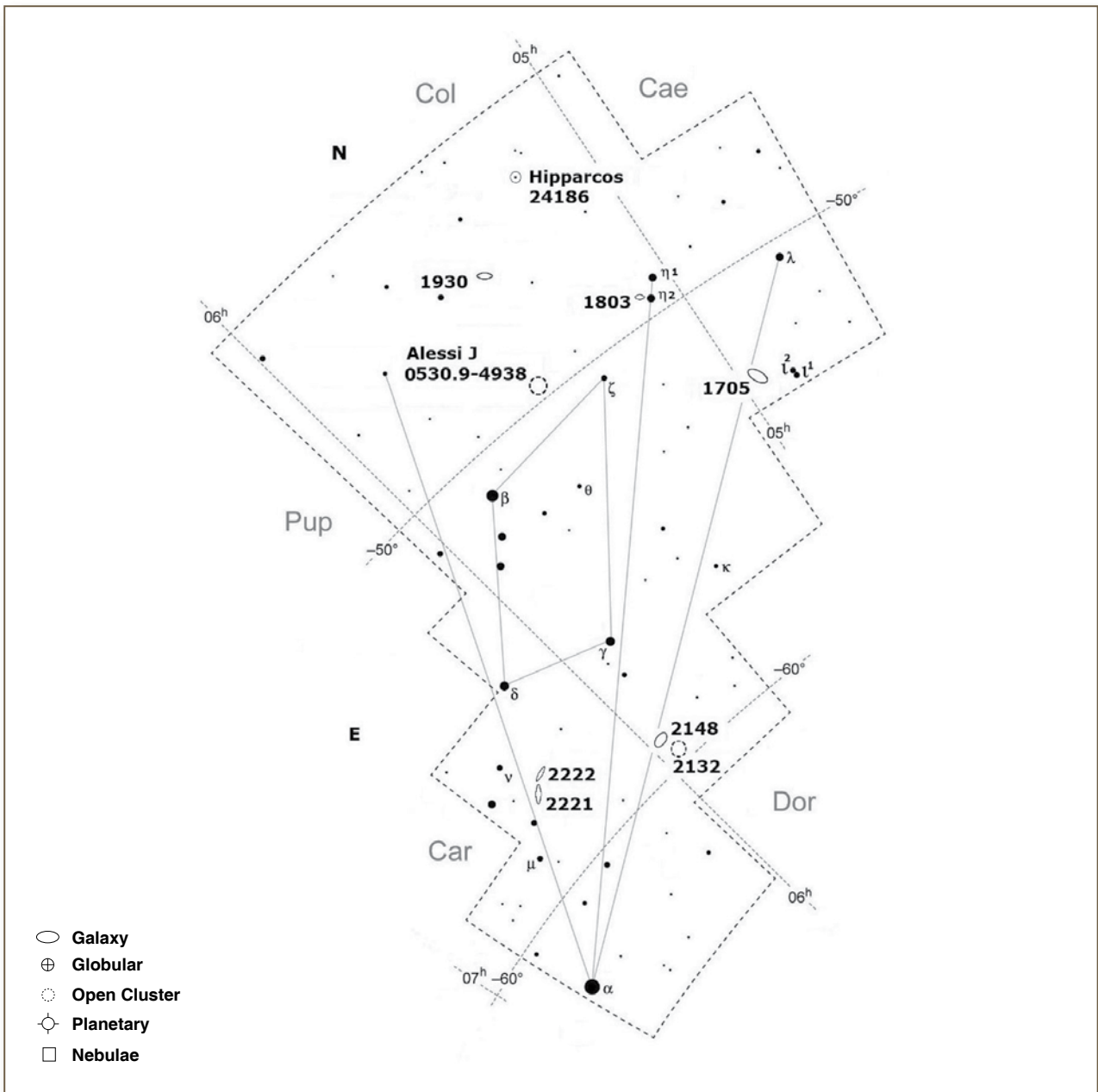


ESO 245-SC09 – Open Cluster

In the extreme south of the constellation is xi Phoenicis which is a double star with a magnitude 5.8 white coloured primary and a 10.2 shady yellow companion, a separation of 13.2" and position angle (PA) of 253° . If you are brave enough, search out two galaxies NGC 215 and NGC 212, just 5' apart from one another situated 20' north-west of xi Phoenicis.

Fly with me, and discover countless starry bird shapes that can be found amongst the many stars that drape our dark night skies.

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 1625	Galaxy	01h07m.7	$-46^{\circ}54'.5$	12.3	1.6'×1.2'
NGC 625	Galaxy	01h35m.1	$-41^{\circ}26'.0$	11.2	5.8'×2.1'
ESO 245-SC09	Open Cluster	01h53m.7	$-45^{\circ}57'.2$	11.5	12'



The constellation of Pictor

PICTOR

The Painter's World

The Painter's Easel is a constellation which Nicolas-Louis de Lacaille named Equuleus Pictoris in 1752, simplified to just Pictor by Benjamin Apthorp Gould in 1877. Most of the constellations named by de Lacaille represent instruments of science or the arts. The French called it The Palette, and in Italian it is known as The Pittore. But by whichever name one might call it, being able to paint is surely a wonderful gift, and finding a reference to that activity in the name of a constellation is hardly surprising or strange. Just as the painter represents images on a canvas using feeling and colours, so the objects in the night sky leave a lasting impression on the eye and mind. Come and explore some of the colourful objects painted on the canvas of the night skies.



The constellation is situated just south of Columba, with Carina to the east and the Large Magellanic Cloud to the south. Pictor stretches across 27 degrees, with fairly faint stars making it extremely difficult to draw the constellation's outline with any precision, but this difficulty is abundantly compensated for by the opportunity to study some exceptional objects along the way.

The galaxy **NGC 1930**, situated in the northern part of the constellation is a somewhat faint object. A few stars situated towards the west of the galaxy easily point the way. Although this star city is faint, the small bright nucleus is what first catches the eye. Closer investigation reveals the core surrounded by a roundish halo. A few double stars can be seen just east from the galaxy.



NGC 1930 – Photograph: DSS

One of the most exceptional stars located within Pictor can be found 3.5 degrees further west of NGC 1930. Hipparcos 24186 is perhaps better known as Kapeyn's Star, a lovely, ruddy-hued Type-M1 magnitude 8.8 sub-dwarf only 12.8 light-years away. The proper motion of 8.7" in a south-eastern direction per year earned it the appropriate name The Flying Star. A pair of prominent, wide double stars can be seen north of Kapeyn's Star, which should help you spot its position.



The Dutch astronomer Jacobus Cornelius Kapteyn was born in Barneveld in the Netherlands on 19 January 1851 and died on 18 June 1922. In his late twenties he became professor of astronomy at Groningen, a post he held until retirement at the age of seventy.

Jacobus Cornelius Kapteyn
Pencil Sketch: Kathryn van Schalkwyk

The Isaac Newton Telescope group on the cliffs of the island of Las Palma probably sounds like a group of sentinels on the edge of a volcano, but it is, in fact, situated more towards the middle and eastern part of the island. At the southern end lies the volcano Cumbre Vieja, whose western flanks may someday collapse into the Atlantic, triggering a mega-tsunami. However, one of the group of telescopes is the 1-metre-mirror Kapteyn Telescope, the naming of which was such a wonderful gesture to this special man.



Kapteyn Telescope: La Palma

The outstanding double star eta Pictoris is situated in the north-western part of the constellation, two beautiful magnitude 5 stars dressed up in rich yellow and orange colours. What makes orange-coloured eta Pictoris2 and the field of view special is the galaxy **NGC 1803** situated only 4.5' towards the east of the star. Yes, I know the object is pretty faint, but take up the challenge, use high magnification and move the star to just outside the eyepiece field, use averted vision and concentrate. Closer investigation shows the galaxy as a haze just slightly brighter towards the middle.

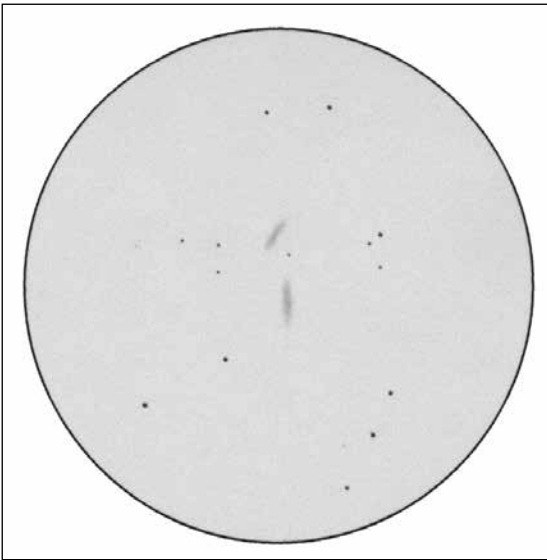


NGC 1803 – Photograph: DSS

About 2 degrees south-east of NGC 1803 is a grouping that is not particularly substantial, but nevertheless worth a visit. The asterism **ALESSI J0530.9-4938** is situated east of zeta Pictoris and consists of five lovely yellow coloured stars slightly in a curved line with the open end towards south. Fainter stars are crowded towards the western field of view.

The lovely double star iota Pictoris is situated in the far western part of the constellation, which could be seen as representing the steady stay of the painter's drawing board. The two members of this attractive pair are very similar in appearance, with a magnitude 5.6 primary displaying a yellow-white colour and the magnitude 6.4 secondary appearing to be slightly yellow-grey, therefore, darker in shade. The separation is 12.3", which is quite easy to split in amateur telescopes. Situated barely 30' west is the galaxy **NGC 1705**, which displays a very hazy oval impression in the company of two faint field stars. From the edge it rises slowly to a brighter middle part.

Move across to the eastern part of the constellation to pin-point beta Pictoris. An intensive study around this magnitude 3.8 white-coloured Type-A3 star, 63 light-years away, is being undertaken of late. An object with a radius 2–3 times that of planet Jupiter was found as it occulted beta Pictoris. A team led by Anne-Marie Lagrange at the Grenoble Observatory, France, announced a possible planet orbiting inside the dusty disk of the youth star beta Pictoris at a projected distance of only 8 au, putting it comfortably within the realm of the giant planets as in our solar system.



In the central southern part of Pictor is a special pair of galaxies forming an imaginary triangle of 1.5 degrees to the west with magnitude 5.8 ν Pictoris and magnitude 5.6 μ Pictoris. **NGC 2221** and **NGC 2222** are a nearly identical twin system – I cannot think of them in any other terms: If you have not been able to spot them, don't be concerned – this is a very difficult pair of galaxies to glimpse even with bigger amateur telescopes.

NGC 2221 and NGC 2222 – Galaxies

Although it's a challenge, I spotted these two with averted vision from my very dark observing site. Higher magnification and care are needed to reveal that both grow a little brighter towards the middle area. The direction of NGC 2221 is north to south and is slightly larger and slimmer. The northern companion galaxy NGC 2222 is tilted in a north-west to south-east direction and a tad smaller, barely 1.5' towards the north. In the west, a visible double star forms a triangle with the two galaxies. I have not dared to suggest searching for the very faint galaxy PGC 18839, which has a magnitude of 15, just 2.5' further north of the galaxies.

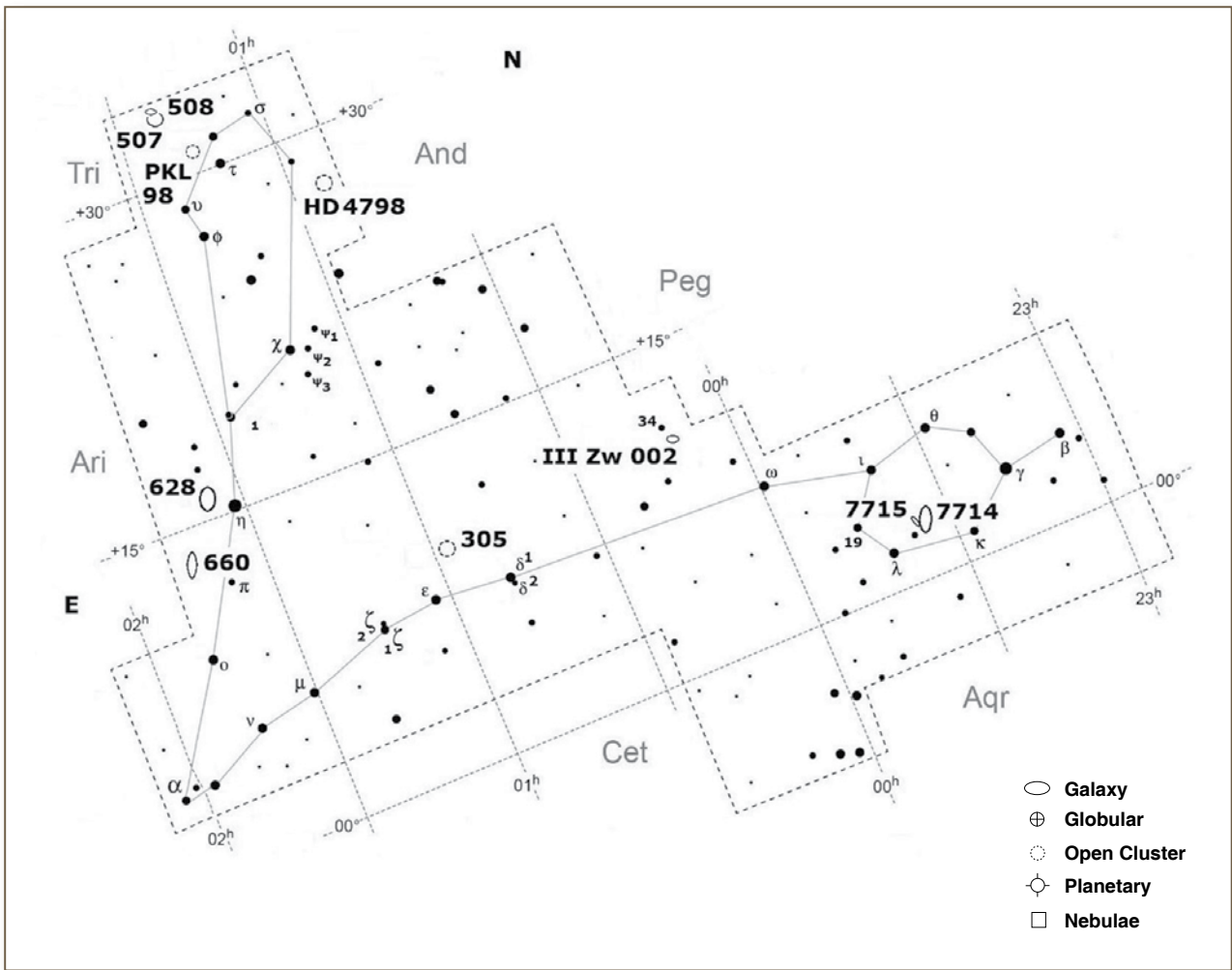


Galaxies NGC 2221 and NGC 2222, with PGC 18839 at the top.
Photograph: Dale Liebenberg

Two objects, **NGC 2148**, a galaxy, and **NGC 2132**, a star cluster, can be found within a one-degree area in the far south-eastern part of the constellation. The galaxy NGC 2148 displays only an extremely faint, roundish glow. The star cluster NGC 2132, about 52' south-west, comprises more than a handful of various magnitude stars that are slightly more outstanding against the background star field. What is, however, more notable, is the fact that the stars vary from yellow to deep orange in colour. Closer investigation reveals many fainter stars accompanying this group of stars, a surprise package. Its southern member, HD 40307, which is situated only 42 light-years away, has been studied in detail lately and has been found to house a few super large bodies orbiting this orange dwarf star. The exoplanet-hunting HARPS spectrograph (High Accuracy Radial Planet Searcher) in Chile discovered that HD 40307g lies in the system's habitable zone with a mass of between 4 and 10 earths. The exoplanet's orbital period is 198 days, meaning HD 40307g receives about 62 percent of the heat earth receives from the sun (John Bochanski).

In the normal course of events the heavens may sometimes come across as uninteresting when one merely glance at them, just in passing, as it were – but the next time you're decide to wander around outside under the starry skies, explore some of the colourful objects painted on the canvas of the night sky and observe the deep-sky objects through different eyes.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1705	Galaxy	04h54m.2	-53°22'.2	11.8	1.8'×1.4'
NGC 1803	Galaxy	05h05m.5	-49°34'.5	12.9	1.3'×0.8'
Hipparcos 24186	Star	05h11m.8	-45°02'.4	8.8	*
NGC 1930	Galaxy	05h25m.9	-46°44'.5	11.5	1.9'×1.2'
ALESSI J 0530.9-4938	Asterism	05h30m.8	-49°38'.8	9.5	12'
NGC 2132	Open Cluster	05h54m.5	-59°50'.8	8	25'
NGC 2148	Galaxy	05h58m.7	-59°07'.6	13.7	1.1'×0.8'
NGC 2221	Galaxy	06h20m.3	-57°34'.8	13.2	2'×0.5'
NGC 2222	Galaxy	06h20m.4	-57°32'.2	13.6	1.5'×0.3'



The constellation of Pisces



NGC 7714 and NGC 7715 – Photograph: DSS

PISCES

Two Fishes in the Starry Sea

The constellation of Pisces is distinctive and special, with the characteristic "V" formed by the stars within the image. Fishing must certainly have been a major source of food supply in antiquity. The star alpha Piscium (a very close pair of magnitude 4 and 5.2 stars), connects the tails of the two starry fish projected by the constellation at a slight angle just to the north of Cetus. Two circlets combined together – one to the southerly side of Pegasus and the other towards the north-eastern side of Pegasus, which appears as the smaller fish. In ancient Babylon the constellation was seen as sacrificed fishes to the god of water and wisdom. It is even possible that the constellation reflects the period of Christ, which refers back to the two fishes and 5 loaves.

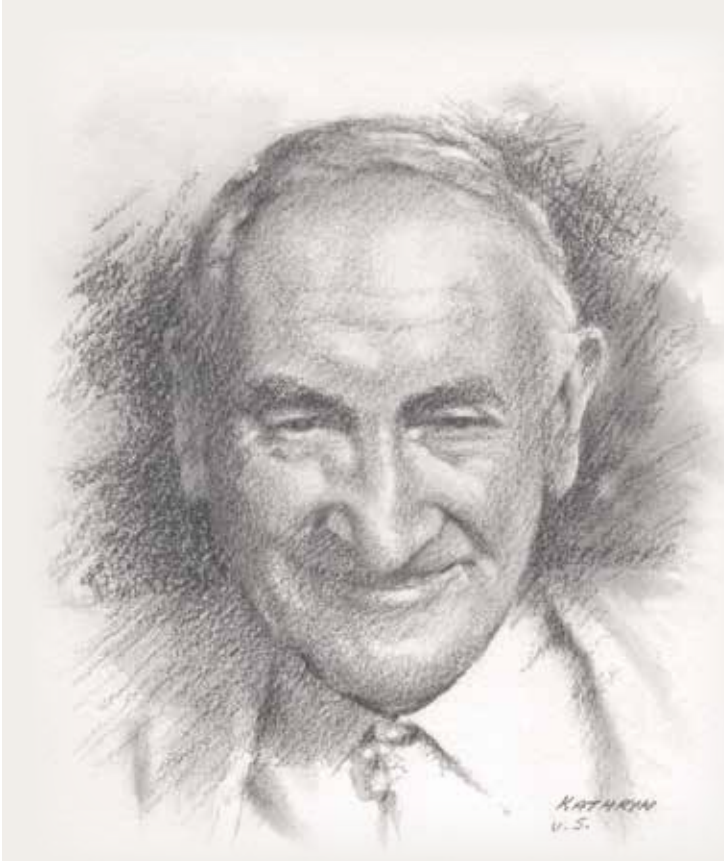


Pisces as a constellation houses some of the objects with the lowest numbers on the NGC list, and is also the last of the 12 zodiac sign constellations to have been named. But alas, because the constellation is so far from the Milky Way it does not contain very bright objects. Although Pisces does boast a multitude of galaxies, most of them are too faint to observe; nonetheless, there is a lot of interesting data associated with some of them.

The larger fish appears to be almost hugging the northern border of Pegasus, perhaps more evident the circlet made up of the star's iota, theta, gamma, kappa, lambda and TX or 19 Piscium, a red irregular star. The star beta Piscium is at the western end, indicating the tip of the fish-nose.

Very appropriately, the inner circle swallows up the galaxies **NGC 7714** and **NGC 7715**, which interact with each other. They are situated in a 1.5-degree triangle slightly north of kappa and lambda Piscium. NGC 7714, the larger galaxy, is slightly oval in shape with a sudden brighter nucleus with the companion galaxy NGC 7715 hugging the eastern edge. The companion however, in a north-east to south-west direction, is extremely faint and difficult even to glimpse by any means. In-depth photographs of this pair show NGC 7715 only as an elongated stream of faint dust. The yellow-coloured magnitude 5.6 star is situated just 4' towards the south-east, which also makes observation difficult, but it is a good star mark to search out this pair. John Herschel discovered this outstanding pair on 18 September 1830.

A strange pair of galaxies, **III Zw 002**, can be found about 5 degrees north of omega Piscium. The smaller galaxy has an extremely high compact redshift for its apparent magnitude and colours that resemble a quasi-stellar source due to hydrogen emission lines. However, the larger galaxy was initially classified as a Seyfert-type, but later included in the PG Quasar data basis. The galaxy shows dramatic radio outbursts roughly every five years, but interestingly, before and after the rapid expansions, there was a period of virtually no expansion. The jets interact with a molecular cloud, describing the inflating balloon model and the evolution of radio lobes.



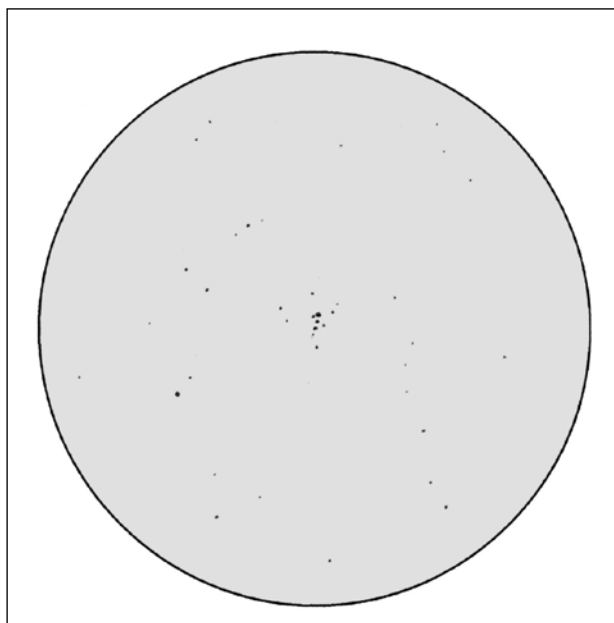
Fritz Zwicky – Pencil Sketch:
Kathryn van Schalkwyk

The Zw galaxies were named after Fritz Zwicky who was born in Varna, Bulgaria on 14 February 1898 and died at 8 February 1974. He received an advanced education in mathematics and experimental physics at the Swiss Federal Institute of Technology, located in Zurich Switzerland.

He reasoned that the violent collapse and explosion of a massive star would leave a dense ball of neutrons, formed by the crushing together of protons and electrons. Such an object, which he called a "neutron star," would be only several kilometres across but as dense as an atomic

nucleus. This bizarre idea was met with great scepticism. The notion that an entire star could be made of such an exotic form of matter was startling. Zwicky made a persuasive case that supernovas actually occur and ought to be observable in other galaxies and predicted the existence of low mass galaxies. He discovered the first such dwarf galaxy with the 100-inch telescope at Mount Wilson Observatory. Zwicky in effect discovered that most of the mass in the universe is invisible and called it dark matter. He was responsible for positioning numerous cosmological theories that have a profound impact on the understanding of our universe today.

Halfway along the slender fish body, epsilon Piscium points the way to a very small, tight, open cluster. **NGC 305** is situated among several galaxies, all very faint. However, this open cluster is special and displays a very tight faint grouping of about eight stars running in a north-south direction. The brightest northern-most star in this grouping is a buttery-yellow-coloured magnitude 11 star. It is also a double star with an equally yellow companion to the east. To find such a lovely grouping, although faint in galaxy world is such a nice surprise. The cluster forms a triangle north of the galaxies IC 62 and IC 57, spanning only 50' distance between them.



NGC 305 – Open Cluster

The cluster **HD 4798 GROUP**, after the identification of its brightest star is situated in the far north-western part of the constellation and only 8' from the Andromeda border. Robert Douglas sees this little gem, which comprises six stars of various magnitudes, as a flying wing. What stands out is the combination of yellow-coloured stars taking pride of place alongside the brighter magnitude 7 orange coloured star.

Further north-east, another group of stars can be found. Sadly, the grouping is rather faint, but for the odd diversion within galaxy world, searching for it can be worthwhile and fun. I could ferret out only three magnitude 12 stars in a north-south formation, together with a few fainter stars. The cluster is listed as **PKL 98** – Platais-Kozhurina and van Leeuwen (1998). Identified via Hipparcos proper motion data by Platais (*Star Clusters* – Archinal & Hynes).

A rich galaxy group known as the Pisces Group of Galaxies is situated virtually on the border with Andromeda. In the central concentration of the group, which could total a few hundred galaxies, is the peculiar galaxy known as **NGC 507**. The galaxy displays a lovely round haze, brighter than one would have expected it to be. The nucleus is a third of the total glow and quite outstanding. NGC 508, another elliptical galaxy on the periphery of NGC 507's northern edge, is considerably smaller, but relatively bright, and shows concentric rings in deep photographs. NGC 504, slightly further south of NGC 507, is a smart, edge-on galaxy, but rather faint to appreciate to its full capacity. Just west, a lovely bright yellow coloured magnitude 7.6 and golden magnitude 10 pair of stars complement this immediate group of galaxies.



NGC 660 – Photograph: 24-inch telescope on Mt Lemmon AZ – Joseph D. Schulman

The smaller starry fish stretch along the north-eastern border of Pegasus, with the middle area indicated by eta Piscium, which glows with a magnitude of 3.6, with two close outstanding objects only a step away from the star. The very rare galaxy **NGC 660**, which is called a polar ring-galaxy, can be spotted about 3 degrees south-east of eta Piscium and only a degree west of the border with the constellation Aries.

It is a type of galaxy in which an outer ring of gas and stars rotate over the poles. These polar rings can form when two galaxies interact with each other. Material is tidily stripped from a passing galaxy or it could be that a smaller galaxy collides with the larger galaxy's plane of rotation. It is impossible to see the ring through ordinary amateur telescopes, but with favourable dark night vision the galaxy might be seen as a fairly hazy oval. Some observers claim that they can spot a shape slightly resembling an "S" through larger telescopes. What stood out for me with high magnification was that the northern part of the galaxy fades out considerably more than the slightly defined southern part. The nucleus is not at all outstanding, just a slight brightening towards the middle area. On the western edge of the galaxy a magnitude 10 pair of stars comes to light. Even though the galaxy is visible only as a washed-out oval cloud, it is incredible when one thinks of and tries to grasp the process and composition of the object. William Herschel discovered this galaxy on the night of 12 September 1784.

The showpiece of the Pisces constellation is **NGC 628**, also known as Messier 74, the one and only Messier object to be found in Pisces. This large face-on galaxy is situated only 1.3 degrees east of eta Piscium and outstanding against the starry field. Although listed as relatively bright, the surface brightness is low, since the visible light is spread over a large area. With high magnification and steady observation, the glow seems granular, enfolding a small nucleus. A flimsy unwinding structure can be glimpsed which cannot be defined, but which probably constitutes the spiral arm structures. Towards the west a handful of faint stars drape down into the southern field of view.

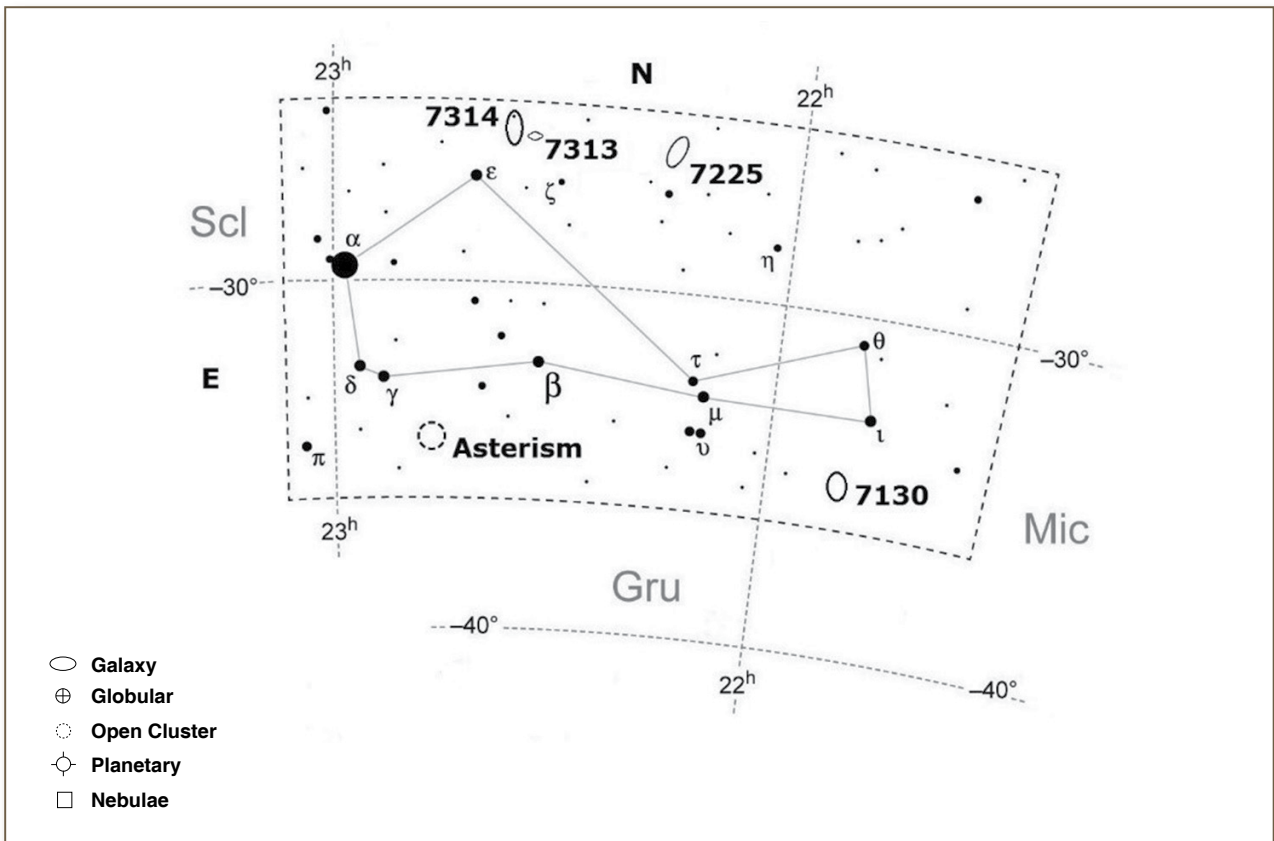
So much more can be discovered and said about this galaxy, but the best is to study this object in more detail for oneself! The distance to this galaxy is about 24 million light-years away from us. On 11 July 1991 the asteroid Thisbe crossed over the galaxy, having what many believe to have been a supernova explosion in the galaxy. However, a supernova has been reported in M74 on 27 July 2013 and spectroscopically confirmed as a young type II supernova. The Central Bureau reported position 1.5' east and 2.2' south of the nucleus.



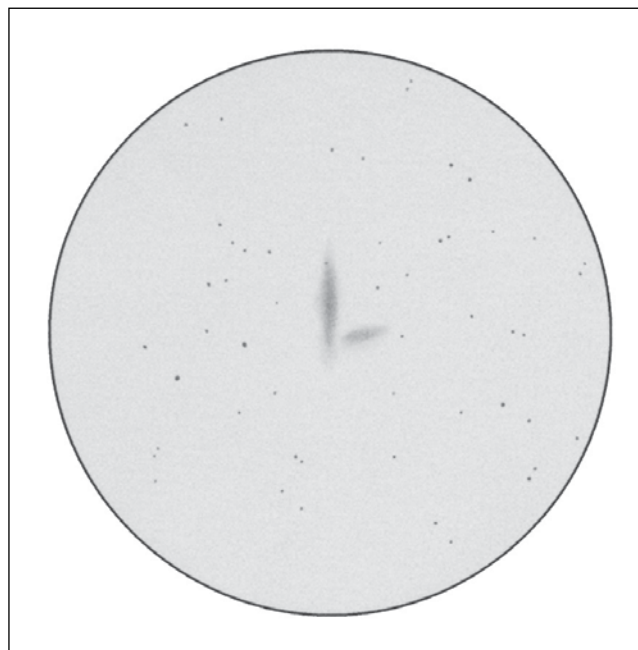
NGC 628 – M74 – Photograph: Wikipedia

If you have time to search, go out and claim galaxies one by one from within the vast starry sea of fish. But be sure to use a moderate to large telescope, and most importantly, pick a very dark starry night.

OBJECT	TYPE	RA	DEC	MAG	SIZE
III Zw 002	Galaxy	00h08m.0	+10°42'.0	18	1.6'
HD 4798	Star Group	00h50m.2	+28°22'.0	9.5	5.6'
NGC 305	Open Cluster	00h56m.3	+12°03'.5	11.5	2.5'
PKL 98	Open Cluster	01h13m.8	+32°01'.7	12	3'
NGC 507	Galaxy	01h23m.7	+33°15'.2	11.2	4.1'×3.5'
NGC 508	Galaxy	01h23m.8	+33°16'.8	13.1	1.3'×1.3'
NGC 628 Messier 74	Galaxy	01h36m.7	+15°46'.8	9.4	10.5'×11'
NGC 660	Galaxy	01h43m.1	+13°38'.6	11.2	9.2'×4.2'
NGC 7714	Galaxy	23h36m.2	+02°09'.3	12.5	1.6'×1.4'
NGC 7715	Galaxy	23h36m.4	+02°09'.6	14	2.9'×0.4'



The constellation of Piscis Austrinus



NGC 7314 and NGC 7313 - Galaxies

PISCIS AUSTRINUS

A Fish

In ancient times it has been said that the southern fish Piscis Austrinus, was drinking from the pure waters flowing south from Aquarius' water-jar also known as the Urn. The Italians called it Pesce Australe, the French called it the Poisson Australe and the Germans the Südliche Fisch, which is far more subtle. The brightest star alpha Piscis Austrini is called Fomalhaut, the mouth of the fish.



The galaxy **NGC 7130** situated in the far south-western part of the constellation displays a round haze with a bright nucleus. For a challenge try to spot the galaxy IC 5121 which is located 11' towards the north-west; it displays a roundish haze, slowly getting brighter towards the middle, but not star-like.

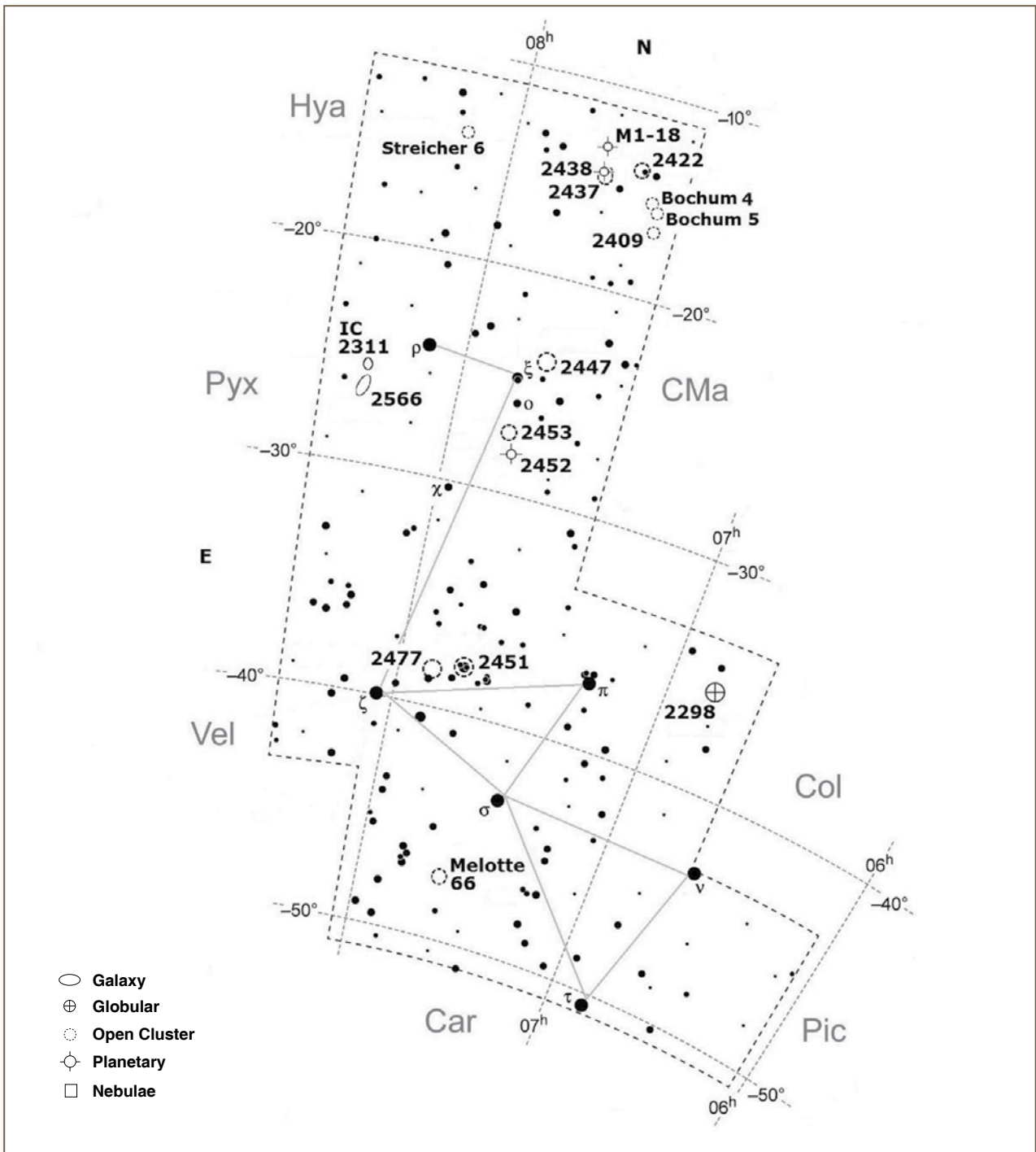
A lovely group of stars situated towards the north-eastern corner in a sort of lopsided question mark or perhaps a figure 2 shape. The brightest member is the magnitude 9 orange coloured star HD 215903 situated more or less towards the middle of the grouping. It can be found at RA: 22h49m.5 – DEC: -33°59'.4, with an overall magnitude of 9 and 12' in size.

The galaxy **NGC 7225** is 1.5 degrees from the border with Aquarius. It is a lenticular galaxy very elongated in a north-west to south-east direction, with a bright small nucleus. The field of view is dominated by a magnitude 6.2 star situated 10' towards the south.

NGC 7314 is a bright galaxy that is very elongated in a north-south direction, with a faint star embedded at the northern tip. The barely seen companion **NGC 7313** appears as an extension towards the western end of NGC 7314, but is very difficult to discern. A bonus is the very impressive star field towards the north-east of the galaxy pair, displaying a group of faint shiny white stars, almost cluster-like.

Make Piscis Austrinus your friend and swim together in the starry sea.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 7130	Galaxy	21h48m.3	-34°57'.1	12	1.7'×1.5'
NGC 7225	Galaxy	22h13m.2	-26°08'.8	12.2	2.2'×1.1'
NGC 7313	Galaxy	22h35m.5	-26°06'.2	15	0.7'×0.5'
NGC 7314	Galaxy	22h35m.8	-26°03'.0	10.9	4.2'×1.7'



The constellation of Puppis

PUPPIS

The Sailing Ark

Aren't we lucky to have a great starry ark sailing in the southern skies to please our eyes just before winter throws its blanket over the southern hemisphere? Puppis and some other constellations were previously lumped together as the constellation Argo Navis. The Germans called Navis the Schiff, the French Navire Argo and the Italians Nave Argo. The ship's four divisions are now known as Carina the Keel, Puppis the Stern, Vela the Sail and the Mariner's Compass Pyxis. From the Bible's reference to Noah's Ark, it was popularly known in the 17th century as the Ark. It was the French astronomer Nicolas-Louis de Lacaille who divided up this monster ship in the 18th century.



From the Bible's reference to Noah's Ark, it was popularly known in the 17th century as the Ark. It was the French astronomer Nicolas-Louis de Lacaille who divided up this monster ship in the 18th century.

Some of the original bright stars belonging to the main constellation have now been divided between the four constellations. The brightest star in Puppis is zeta Puppis, by name Noas, and the only star in this constellation with a reasonably easy name, which has a magnitude of 2.2 at 1400 light-years distant and one of the hottest stars visible. What is so nice about this starry Ark is that our galactic plane cuts through this part of sky.

This is a constellation which is home to many clusters and nebulae. The beauty is that even a pair of binoculars will bring to the eye a feast of star groupings. Roughly, the constellation displays a zig-zag impression if viewed with a wide angle such as the naked eye. The bow comprises 5 stars in the form of tau, the back end, nu, pi, sigma and zeta Puppis, which gracefully steers this ship. A shape resembling the elegant curly wooden front part of the ship and can be seen in the old-fashioned xi and rho Puppis stars.

It would be only fair to start off with a well-known cluster to do justice to this very well-known constellation.

NGC 2422, much better known as Messier 47, graces the northern part of the ship's bow. The observer with a pair of binoculars will be treated to a rather large splash of various magnitude stars, mostly sparkling white in colour.



NGC 2422 – M47 – Photograph:
Dale Liebenberg

An exceptionally bright magnitude 5.5 member takes up its position on the western edge of M47, with fainter stars filling up the surrounding space. Right in the heart of the cluster the double star Struve 555 displays equal white components of magnitude 7.9 and magnitude 9.1 in a position angle (PA) of 228° and a separation of $95.8''$. Also, to be seen is a strong yellow to orange star between its white counter parts.



NGC 2437 – M46 – Photograph: Dale Liebenberg

magnitude 8 member stands out towards the western edge with a companion on its northern side.

A degree east is another well-known open cluster, **NGC 2437**, also known as Messier 46, which perhaps claims the position, as it were, together with M47 as the southern double cluster. In one word, M46 can be described as very impressive. It is an outstanding bright grouping with stars curling out into the field of view. Closer investigation will reveal dark voids between the cluster members. A white

western edge with a companion

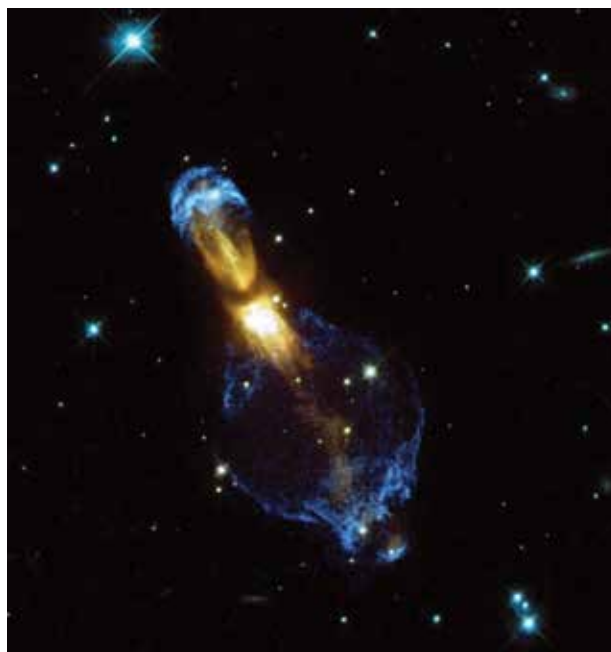


NGC 2438 – Photograph: Dale Liebenberg

nebula could be closer to us, but could perhaps belong to the cluster, seeing that both are about 5000 light-years away.

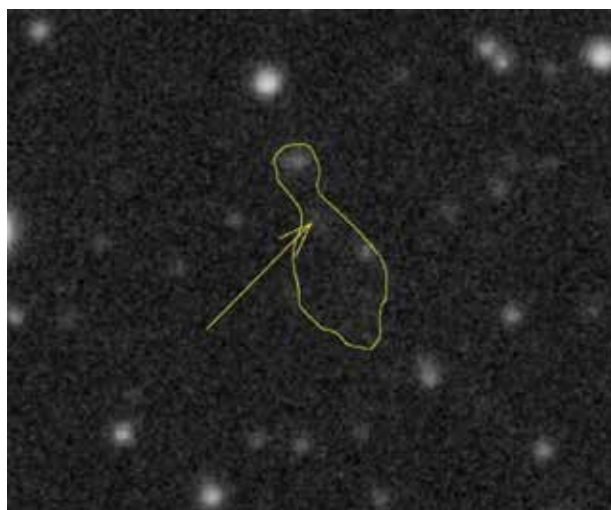
The cluster M46 proudly houses a planetary nebula. **NGC 2438** is situated in the north-eastern corner among the cluster members and is not that difficult to spot. Add higher magnification to see its shiny blue-grey colour and round shape. The central warm magnitude 18 star is nowhere to be seen, but several other faint cluster stars can be spotted in the area. There is speculation that the planetary

There must always be a challenging object that is not always possible to observe through ordinary telescopes but which one cannot neglect to mention. The so-called Calabash Nebula, or perhaps the Rotten Egg, is only 15' further north of M46 and also 5000 light-years distant. It is better known as **M1-18**, although its technical name is OH 231.84+4.22. The beauty of this controversial object can be appreciated only through the eyes of Hubble.



M1-18 – Photograph: NASA
Jet Propulsion Laboratory

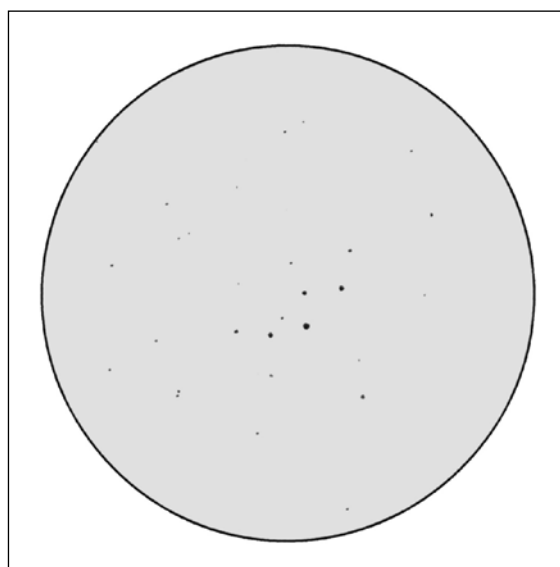
The nebula been named after Rudolph Leo Minkowski (1895–1976) who discovered that there are two types of supernovae. He called the more common ones which had similar spectra, Type-I supernova, the others he called Type-II supernova. Minkowski discovered a record 188 planetary nebulae using objective-prism survey plates while at the Mount Wilson Observatory during the last half of the 1940's.



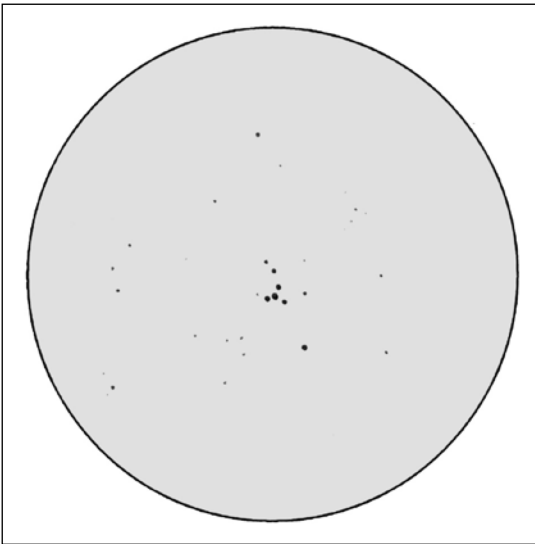
M1-18 – Photograph: Dale Liebenberg
and edited by Auke Slotegraaf

If all fails, the asterism **STREICHER 6** can be found a degree north from the galaxy IC 500. My habit of naming objects is not overlooked with this grouping of stars, which I call the mini-Cassiopeia, as it resembles the glorious constellation Cassiopeia. It comprises mostly magnitude 8.6 stars in a zig-zag shape from north-west to south-east. Not so easy to find, but a crown jewel in the making.

STREICHER 6 – Asterism



PUPPIS – The Sailing Ark



Turn your gaze to M46 and go due south-west for another 3.5 degrees to what is called a doubtful object. The grouping **NGC 2409**, which could be described as asterism-like, displays about seven stars which form a clear north-south string with a twist in the tail. The grouping is compact, outstanding, and comes to the fore as a dainty get-together of stars.

NGC 2409 – Open Cluster

A pair of star groupings named **BOCHUM 4** and **BOCHUM 5** is situated just north of NGC 2409, but however hard one may try, it is difficult to distinguish the clusters against a busy star field. It does, however, appear as if Bochum 4, which displays something of an X shape of faint stars towards the middle area, is the larger composition. Bochum 5, however, can be found only as 6 faint stars in a short uneven string, situated on Bochum 4's southern edge, perhaps creating a larger grouping. Anthony Moffat and Nikolaus Vogt compiled a list in 1970 named Bochum Clusters, after a research institute at Nordrhein-Westfalen Germany. A keen eye will spot small pieces of nebulosity just north-east of the clusters, which is vdBergh 97. The Dutch-born Canadian astronomer Sidney van den Bergh published a list of 158 objects, *A study of Reflection Nebulae*, in 1966.

NGC 2447, also known as the cluster Messier 93, displays a roughly triangular shape with fainter members filling in the gaps. A short string can be glimpsed on the eastern edge, with a few brighter stars mostly yellow in colour on the south-western edge. Fainter stars extending north make this part truly a scattered area making it difficult to define the cluster edge. One could describe this cluster as a pretty colourful grouping, one of the southern hemisphere's best.

Sail 3.5 degrees down south on this old wooden vessel and find the open cluster **NGC 2453**, a tight, medium-sized grouping with various magnitude stars. Fainter V-shape stars stringing out into the north-eastern field of view. With a super-white magnitude 9 star on the north-western edge. This grouping points a few brighter stars towards **NGC 2452**, the planetary nebula neighbour, just 8' south of the cluster. It is a small, bright, light greenish grey globe near the end of its life. With very high magnification and averted vision the planetary nebula appears to grow into an oblong shape, perhaps slightly brighter towards the southern side. The middle area displays a somewhat dark hallow. NGC 2452 is much closer to us than the open cluster NGC 2453, which is about 20 000 light-years distant. Colourful stars situated towards the eastern field of view add a nice, special flair in combination with the two objects.

In this busy star-rich stretch of the spiral arm filled with hazy nebulosity and plenty clusters we are still able to find a galaxy with a companion. The pair, **NGC 2566** and **IC 2311**, is situated 3 degrees south-east from rho Puppis which steers the ship in stormy waters. The oval-shape NGC 2566 in a north-west to south-east direction is a typical so-called barred spiral. The galaxy displays a small, just brighter nucleus, not at all star-like. The much smaller elliptical galaxy IC 2311 is perhaps slightly brighter with an even brighter nucleus. This pair is part and parcel of the now well-known Puppis Concentration of Galaxies.

NGC 2477 is also a naked-eye jewel, 2.5 degrees west of zeta (Naos) Puppis. In favourable sky conditions the cluster appears as a faint mist in a busy star field. The first thought brings to the fore the appearance of a globular cluster. The magnitude 4.4 QZ Puppis is somewhat distracting, so move the field of view slightly northward to escape the star's glare. The cluster appears as a beautiful dense grouping filled with magnitude 10 to 11 stars. With higher magnification, however, it explodes with a mass of even fainter stars. Robert Burnham Junior wrote: "Probably the finest of a galactic cluster. It is a striking group, containing about 300 stars crowded into a 15' field." Bordering on the cluster directly to the north is a loose elliptical ring of magnitude 10 stars about the same diameter as the cluster. Use your utmost imagination, and you'll see a diamond ring, with the cluster forming the stone. NGC 2477 is about 4300 light-years away from us.

The large, bright open cluster **NGC 2451** can be found a degree west of NGC 2477, easily visible to the naked eye. This is a lovely wide group of around a dozen colourful stars with a magnitude 3.6 orange colour star claiming the centre seat.



NGC 2451 – Photograph: Dale Liebenberg



NGC 2298 – Photograph: Dale Liebenberg

around the granular fringes which indicate much fainter stars. The large core is special, slowly getting much brighter towards the middle, covered in faint star dust.



Melotte 66 – Photograph: Dale Liebenberg

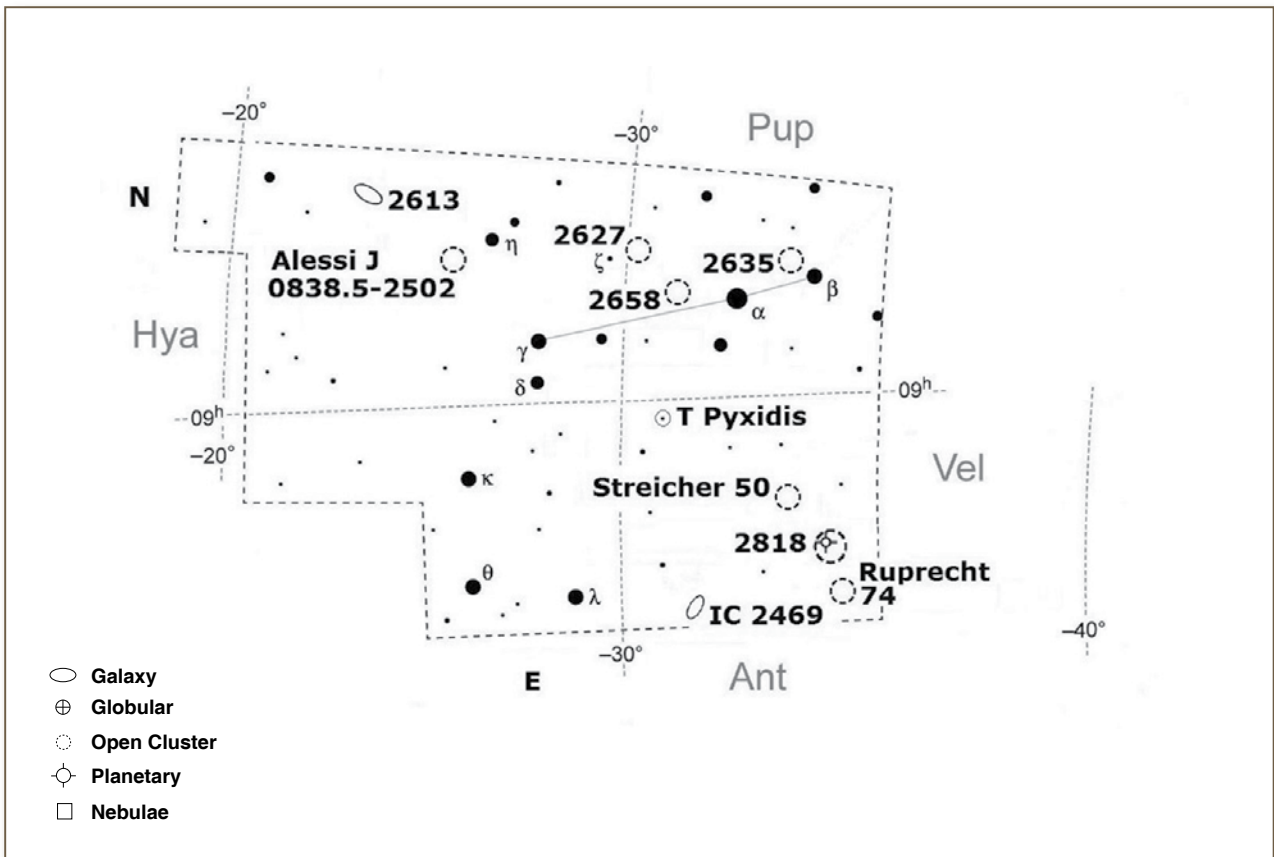
on the south-western side. Two leggy star strings run towards the north-eastern starry field. The eastern part of the group looks slightly denser, with faint short strings. The brightest star is a lovely yellow-orange magnitude 8.3 situated on the southern tip of the cluster.

Puppis is a ship full of surprises. The globular cluster **NGC 2298** is situated only 2 degrees east of the border with Columba, in the far western part of the constellation. It is a large bright globular cluster, well resolved and easy to study. First impression is an irregular globe of haze, but high magnification reveals faint star outliers scattered

Last but not least is another open cluster, **MELLOTTE 66**, situated between a few GN dark nebulae that also host the galaxy NGC 2427 just 1.5 degrees east of the cluster. The cluster is situated within an imaginary triangle east with the magnitude 2.9 tau and magnitude 3.2 sigma Puppis. This special grouping of mainly faint stars displays a boxy shape which edges off quite nicely

This is only the tip of the so-called iceberg. Puppis is a constellation which offers a full shipload packed with surprises. The only way to get to know it well is to unpack the objects one by one.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2298	Globular Cluster	06h49m.0	-36°00'.0	9.2	6.8'
Melotte 66	Open Cluster	07h26m.3	-47°40'.8	7.8	15'
Bochum 4	Open Cluster	07h31m.0	-16°57'.0	7.3	23'
Bochum 5	Open Cluster	07h31m.5	-17°04'.0	7	11'
NGC 2409	Doubtful Open Cluster	07h31m.6	-17°11'.4	7	2.5'
NGC 2422 Messier 47	Open Cluster	07h36m.6	-14°29'.3	4.4	25'
NGC 2437 Messier 46	Open Cluster	07h41m.8	-14°48'.6	6	27'
NGC 2438	Planetary Nebula	07h41m.8	-14°44'.0	10.2	66"
M1-18 OH 231.84 +4.22	Proto Planetary Nebula	07h42m.3	-14°42'.7	12+	12"
NGC 2447 Messier 93	Open Cluster	07h44m.5	-23°51'.3	6.2	15'
NGC 2451	Open Cluster	07h45m.4	-37°58'.0	2.8	45'
NGC 2452	Planetary Nebula	07h47m.4	-27°20'.8	12.6	19"
NGC 2453	Open Cluster	07h47m.6	-27°11'.7	8.3	5'
NGC 2477	Open Cluster	07h52m.8	-38°32'.0	5.8	21'
STREICHER 6 DSH J0808.6-1511	Asterism	08h08m.6	-15°11'.6	10	4'
NGC 2566	Galaxy	08h18m.7	-25°29'.4	11	4.1'×2.3'
IC 2311	Galaxy	08h18m.7	-25°22'.3	12	2.1'×1.9'



The constellation of Pyxis



Vasco da Gama's marble tomb and close-up of his beautifully sculpted image at his last resting place in the Jerónimos Monastery Belém Church in Lisbon Portugal



PYXIS

A Compass Pointing South

Consider, for a moment, the fearlessness of those early seafarers; their daring and courage to explore the mighty oceans of the world. For them the compass was an indispensable aid in their brave undertakings. First there were the Portuguese explorers, like Ponte Vasco Da Gama, born in 1460 in Sines, the province of Alemtejo, Portugal. Vasco da Gama left Lisbon on 8 July 1497 with four ships and a crew of 170 men on a quest to discover a route from Portugal to the East.



To the Portuguese navigators the Southern Cross constellation was a symbol of their faith. Following the route taken by earlier explorers, like Bartolomeu Dias in 1488, they sailed via Tenerife and the Cape Verde Islands, reaching Lüderitz (which Dias thought was Cape Point) in November 1497. He finally rounded the Cape of Good Hope and went on to India. Another was Ferdinand Magellan (1480-1521), after whom the two Magellanic satellite galaxies of our Milky Way have been named.

The French astronomer Nicolas Louis de Lacaille was responsible for naming some of the newer southern constellations and of course Pyxis (originally Pyxis Nantica), the Mariner's Compass, was one of those to be accorded its place of honour against the southern night sky. The starry compass steers the stately ship of ancient times accurately through the southern skies and is situated on the eastern edge of the Milky Way between Vela and Puppis.

A little asterism called **ALESSI J0838.5-2502** is situated inside the western tip of nebula LBN 1073. Seven outstanding stars can be seen in a curved formation, with brightness ranging between magnitudes 8 to 9. They drape from north-west to south-east with a pair of coloured yellow stars claiming centre spot. The star eta Pyxididis with a magnitude of 5.2 is situated 1.2 degrees south of this little group of stars.

The open cluster **NGC 2658** only 35' north of alpha Pyxididis, contains about a dozen faint stars with unresolved stardust, indicating more members. Strings of faint stars can be detected in the north-eastern part of the cluster. It is an attractive group of stars that stands out well against the fainter background star field.

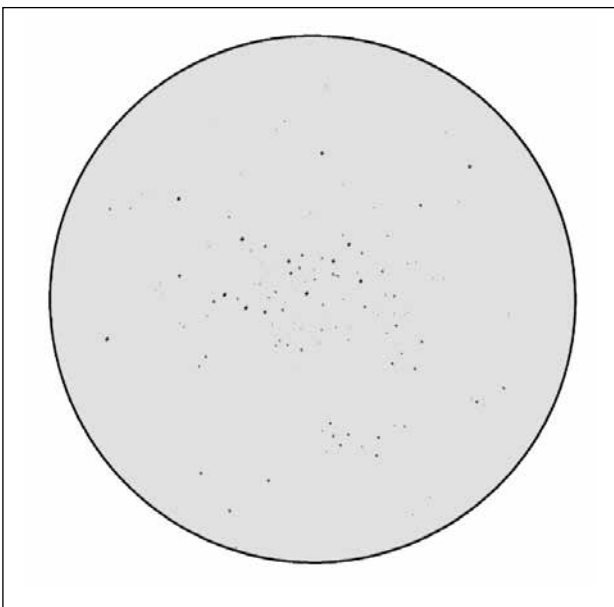
A major cluster of galaxies which is about 65 million light-years away, and known as the Puppis Concentration, spills over the Puppis border into the constellation of Pyxis.



NGC 2613 – Galaxy
Photograph: astrosurf.com

One of the members is **NGC 2613**, situated in the northern part of the constellation. NGC 2613 is a barred spiral and is slightly elongated in a north-west to south-east direction, with hazy edges. The north-western part seems brighter and longer. The relatively small, bright nucleus gives the impression of being lopsided towards the north-west. A string of very faint stars swings around the galaxy from the western edge towards the south.

Intense deep photographs of this galaxy reveal multiple spiral arms. A number of LBN nebulae can be found within an area of 2 degrees east of NGC 2613. Using nebular filters makes the field around this area appear quite hazy.

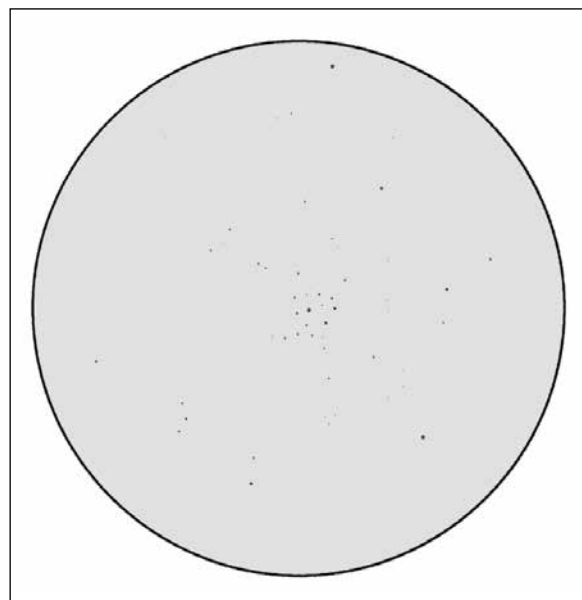


NGC 2627 – Open Cluster

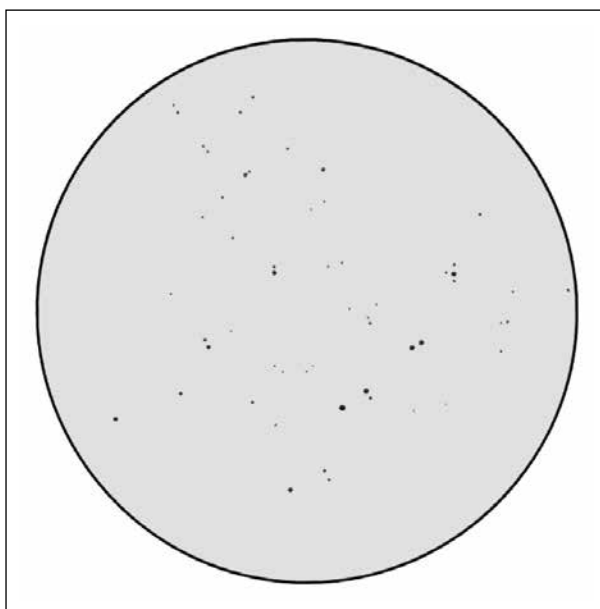
Further south, the magnitude 4.9-star zeta Pyxidis can be seen with the open cluster **NGC 2627** situated only 40' south. The cluster appears very irregular, spacious, quite large, and packed with varied-magnitude stars. The main focus of this cluster is a prominent curved string of stars from east to west, clearly dividing it into two parts. The western end of the string is nicely edged by a pair of magnitude 10 stars. The bulk of the cluster, and also the brightest part, is situated towards the north. Among the stars of NGC 2627, also known as Bennett 40, a few scattered dark patches and lanes can

be detected. The smaller section of the group, with fainter stars, is concentrated towards the southern side. The remainder of the stars in this patchy cluster are situated in the eastern side. My attention was held by the colourful stars in this cluster, shaded from white to deep yellow.

Another open cluster, very different, but well worth exploring, is situated 40' north-west of the lovely buttery-yellow star beta Pyxidis, which indicates the southern tip of the compass needle. **NGC 2635** is a small, dainty grouping, consisting of only a few faint stars. It could also be seen as a typical tight boxy grouping, but nevertheless stakes its claim quite well. The group has something of a V-shape in a north-south direction. The area west of beta Pyxidis contains a few diffuse nebulae, making the field of view very interesting, although not easy to observe without the aid of filters.



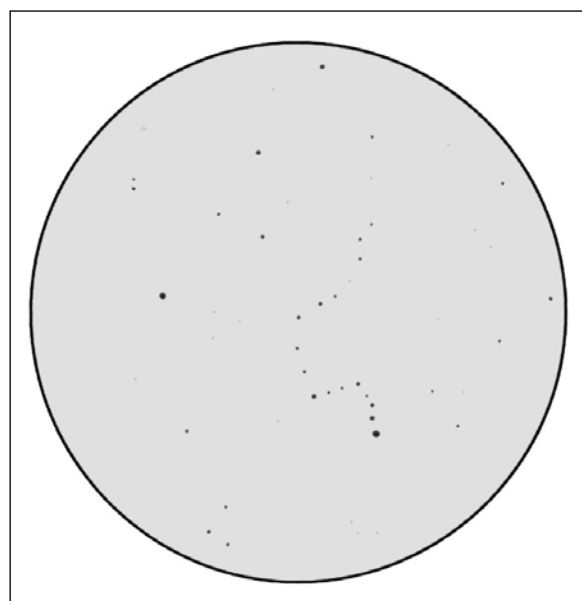
NGC 2635 – Open Cluster



STREICHER 50 – Asterism

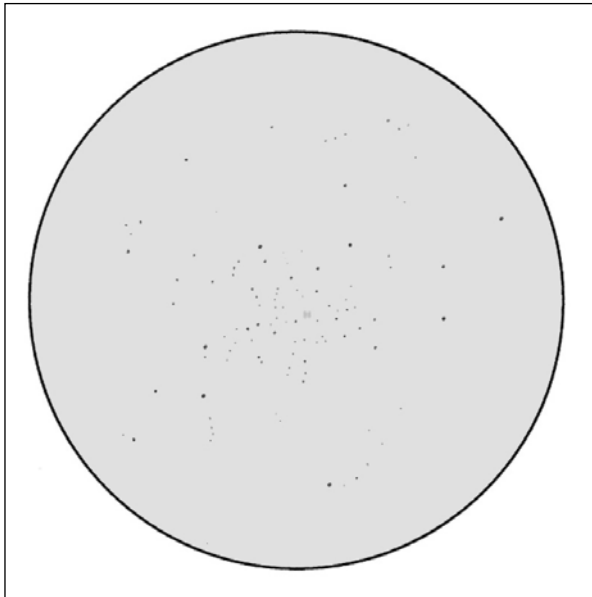
The asterism, **STREICHER 50** is situated in the southern part of the constellation. No fewer than thirteen various magnitude look-a-like pairs are exhibited in a 40' field of view. The centre of the field is characterized by a few brighter stars which also appear to be double. Probably nothing outstanding, but still noticeably different from been seeing in an ordinary star field.

The faint open cluster **RUPRECHT 74** can be found a degree from the border with the constellation of Vela in the far southern part of Pyxis. A handful of faint stars forming a strange wide zigzag string which is quite noticeable against the background star field.

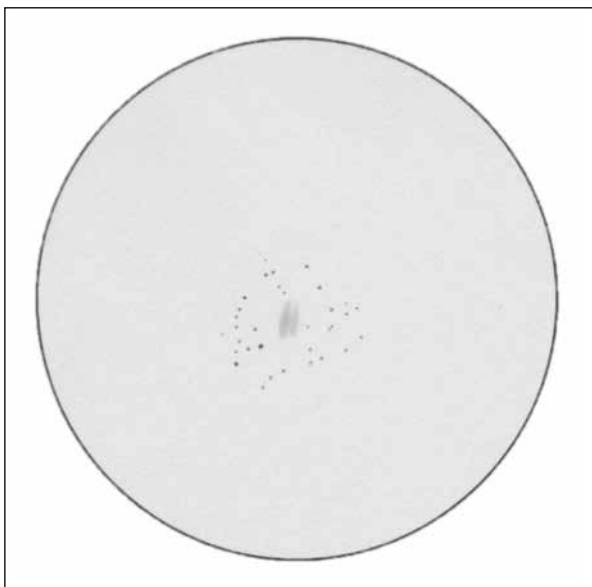


RUPRECHT 74 – Open Cluster

Not to be judged on an IC catalogue with fairly dim objects, is a relatively bright listed galaxy, **IC 2469**, which is situated 50' west of the border with the constellation Antlia. The galaxy shows a slender, elongated haze in a north-eastern to south-western direction with a small, obvious and bright nucleus. The slender south-eastern part of the galaxy seems to be better defined and perhaps slightly brighter. A faint magnitude 12 star can be seen exposed towards the south-western tip. The galaxy was missed by John Herschel, son of William Herschel, and picked up in 1897 by Lewis Swift (1820-1913). Swift discovered 970 NGC/IC objects during his astronomy career.



NGC 2818 – Open Cluster



NGC 2818 – PK 261+8.1
Planetary Nebula

The compass constellation also provides a two-in-one object. Situated virtually on the border with Vela is **NGC 2818**. It is a beautiful, lacy cluster and appears to form a slightly irregular oval shape from west to south. Nearly 50 members between magnitudes 12 to 13 make an outstanding impression against a sparse star field.

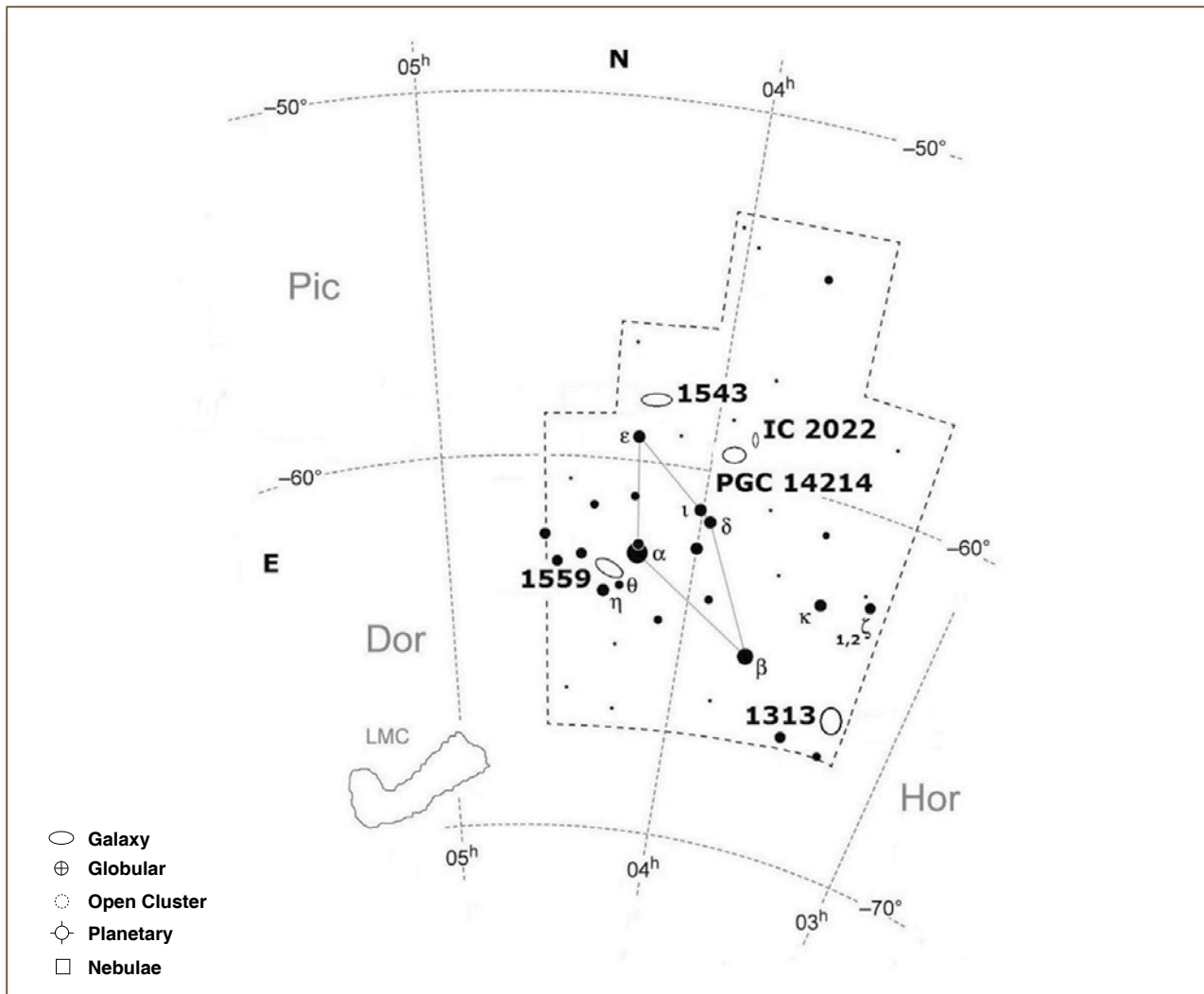
The beauty of this object is the confirmed planetary nebula situated inside and near the western edge of the cluster. It appears as a small haze, easily seen embedded between the cluster of stars. With really high magnification the nebula is divided into a pair of lobes, east and west, in a typical dumbbell shape. The western edge of the nebula displays a small dent on the side. References indicate the nebula as NGC 2818 and the cluster as NGC 2818A. SIMBAD agrees, but in the NGC-IC catalogue they are both listed as NGC 2818, without any comments. The planetary nebula is also listed as PK 261+8.1.

The constellation also had a very faint globular cluster in its midst. Known only as the Pyxis Globular Cluster, it anchors itself towards the sails of Vela against the southern border of the constellation.

The star T Pyxidis is a classic example of a nova which has shown recurring outbursts. The first outburst occurred in 1890, and was followed by further outbursts in 1902, 1920, 1944 and 1966. With an average interval between outbursts of 19 years, astronomers had been expecting another recurrence from around 1985. But this time the star made everyone wait, and only showed its sixth recorded outburst in 2011; an interval of no less than 45 years! T Pxyidis is normally a little fainter than magnitude 15 at quiescence (Tim Cooper). During early April 2011 it started to brighten slowly, peaking at sixth magnitude by the middle of May. M. Linnolt from the U.S.A. picked up the first signs with a visual magnitude of 13 on 14 April 2011 UT Time. I observed the star on a regular basis over many years with the aid of a star map. On the night of 15 January 2010, I located T Pyxidis again among its familiar faint neighbours, and could see the star only as an extremely faint ghostly flickering. When I observed T Pixidis towards the end of April 2011, it was shining with an estimated magnitude of 8.5 in a quite unfamiliar star field due to the brighter nova. It was one of these rare observations that will linger in the mind for quite some time. How long will the interval be before the next outburst? Will it be short, or will T Pyxidis keep us hanging on again as it did this time?

This is only the tip of the so-called iceberg. Puppis is a constellation which offers a full shipload packed with surprises. The only way to get to know it well is to unpack the objects one by one.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2613	Galaxy	08h33m.4	-22°58′.0	10.5	7.6′×1.9′
NGC 2627	Open Cluster	08h37m.3	-29°57′.0	8.4	11′
NGC 2635	Open Cluster	08h38m.5	-34°46′.3	11.2	3′
ALESSI DSH J0838.5-2502	Asterism	08h38m.5	-25°02′.4	9	13′
NGC 2658	Open Cluster	08h43m.4	-32°39′.0	9.2	12′
T Pyxidis	Variable Star	09h04m.7	-32°22′.8	6.3 14	Period: 19 years
STREICHER 50 DSH J0911.2-3558	Asterism	09h11m.2	-35°58′.4	8.3	33′
NGC 2818	Open Cluster Planetary Nebula	09h16m.5	-36°37′.0	8.2	9′
RUPRECHT 74	Open Cluster	09h21m.0	-36°56′.7	13	2′
IC 2469	Galaxy	09h23m.1	-32°26′.9	11.3	4.7′×1′



The constellation of Reticulum



A historical plaque, commemorating Nicolas Louis de Lacaille's monumental contribution to astronomy carried out in South Africa during the years 1751 to 1752 was affixed to the wall of a building in Strand Street, Cape Town. The plaque, however, sadly disappeared in 2010

Photograph: The Astronomy of Southern Africa by Patrick Moore and Pete Collins, courtesy of South African Astronomy Library Cape Town

RETICULUM

The Celestial Crosshairs

It is most appropriate to discuss one of the most vital parts of the telescope – the reticule, immortalised by the constellation Reticulum. However, Reticulum is Latin for a “net”. One can imagine astronomers fishing out the discoveries from among the southern stars. But the name translates more simply as an eyepiece reticule rather than a net.



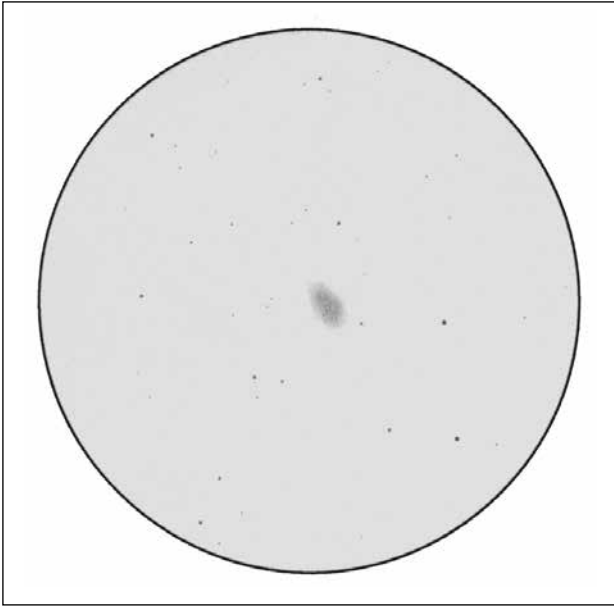
The constellation was defined by the French astronomer Nicolas Louis de Lacaille, who adopted Reticulum to honour the eyepiece with rhomboidal crosshairs which he used to measure star positions while at the Cape of Good Hope. The constellation's geometric shape had however been noticed and mapped as early as 1621 in German records by Isaac Habrecht (1589–1633) as a constellation he called Rhombus.

Known as the great Reticulum galaxy, **NGC 1313** is situated in the south-western corner of the constellation, and 3 degrees south-west of beta Reticuli. It appears bright, slightly hazy and irregular in a north-east to south-west direction. The north-eastern spiral arm, however faint, tapers slightly down to a slender curved brighter tip. The galaxy had a high surface brightness with a barely visible distorted barred nucleus. The companion galaxy NGC 1313A is situated 16' to the



NGC 1313 – Galaxy
Photograph: Dale Liebenberg

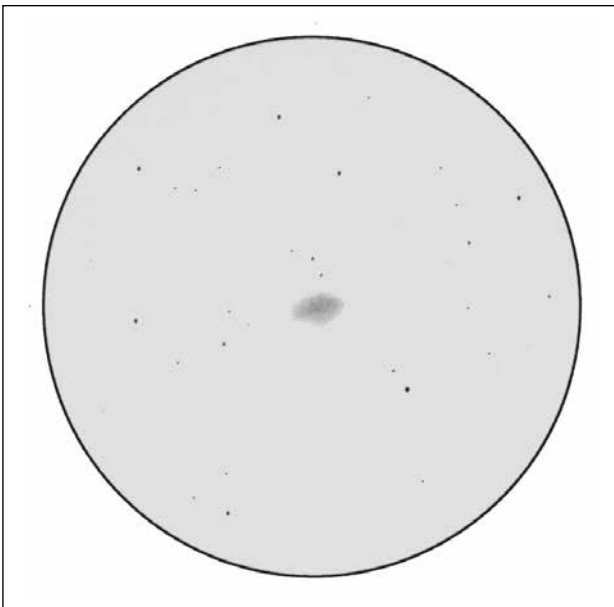
south-east but very difficult to spot in any amateur instrument. The world's largest telescopes indicate luminous H II regions which outline the two main arms and bar, with a break near the optical nucleus. Isolated patches of star formation are found in the south-west region of the galaxy, as well as beyond the rim of the northern arm.



NGC 1559 – Galaxy

NGC 1559, situated midway between alpha and theta Reticuli, is a galaxy with a story attached to it. The Reverend Robert Evans from New South Wales visually discovered three supernovae in this galaxy. The first one, 1984j, the next 1986L, and another one 2005df shortly after midnight on 5 August 2005. With a magnitude of 12, supernova 2005df also turned out to be the brightest supernova discovered that year. Be sure to shift the glare of the bright alpha Reticuli, which is located only 30' north of NGC 1559 out of the field of view, in attempting to view this galaxy, which shows as a smooth glow

in a north-east to south-west direction. The north-eastern tip is covered in haze, with a slightly more defined south-western part with a magnitude 11.8 star situated just off the south-west. Higher magnification reveals that the galaxy gradually brightens towards the middle area. With careful observation and high magnification, I could just make out surface texture with uneven parts. This galaxy is roughly 50 million light-years distant.



NGC 1543 – Galaxy

Reticulum is conveniently located between the two Magellanic Clouds, with a somewhat crooked diamond shape. The constellation houses a wealth of deep sky objects. The northern part of Reticulum is strewn with galaxies. **NGC 1543** is but a small oval hazy glow in an east-west direction 1.5 degrees north of magnitude 4.4 epsilon Reticuli. The galaxy has a high surface brightness and a very compact bright nucleus. Deep images show this galaxy possessing an extended outer halo.

The constellation boasts a remote globular cluster that was discovered in 1973 with the 24-inch Maksutov telescope at Chile's Cerro Calán Observatory. Known as the Reticulum Globular Cluster, it is situated in the far north-eastern part of the constellation very close to the border with Dorado. The globular cluster is located only about 10 degrees from the centre of the Large Magellanic Cloud and most probably belongs to it. It has recently been studied with the 4-metre reflector at Cerro Tololo Inter-American Observatory, and is estimated to be about 157 000 light-years distant. The system also has a few pulsating variable stars with periods of less than a day.

The constellation's brightest star magnitude 3 alpha Reticuli indicates the eastern point of the cross hair-shape. The star has a visual companion of apparent magnitude 12 with a separation of 48".

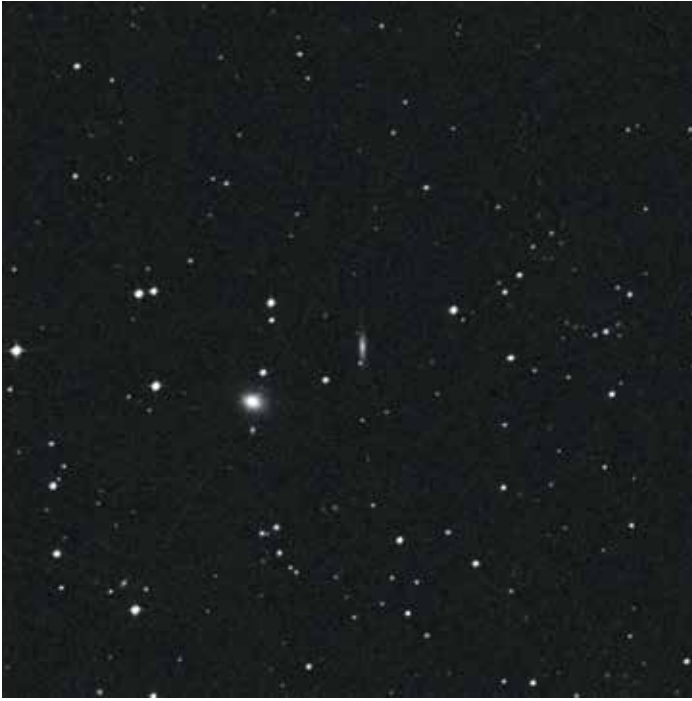
The lovely outstanding yellow double star zeta Reticuli is situated in the far western part of the constellation and a few arc-minutes from the Horologium border. In real dark skies the pair, consisting of a magnitude 5.2 and 5.5 components, can be glimpsed with the naked eye.

At the turn of the nineteenth century, Walter Gale was an active amateur astronomer living in Paddington, New South Wales and found a few double stars with his 8.5-inch reflecting telescope. He published a short list of discoveries in *Astronomische Nachrichten* in 1896, consisting of five double stars and a ring planetary nebula (IC 5148 - the Spare Tyre Nebula). Two of the pairs turned out to be already known so the WDS now contains but three of his double stars.

The second on the list was a close pair in Reticulum called GLE 1, to be found at RA:04h16m20.92 – DEC: $-60^{\circ}56'54.8''$). The stars, just 2 degrees east of delta Reticuli, whose visual magnitudes are 6.8 and 7.5, passed through periastron in 2002 and are now slowly widening again, although the current separation of 0".35 at (PA) 218° does require at least a 30-cm telescope and a dark night sky. This system also contains the star TT Reticuli which is an alpha CVn variable with small amplitude and period of 2.8 days (*The Webb Deep-Sky Society* – Bob Argyle).



Walter Gale – Photograph: Ianmaas. museum



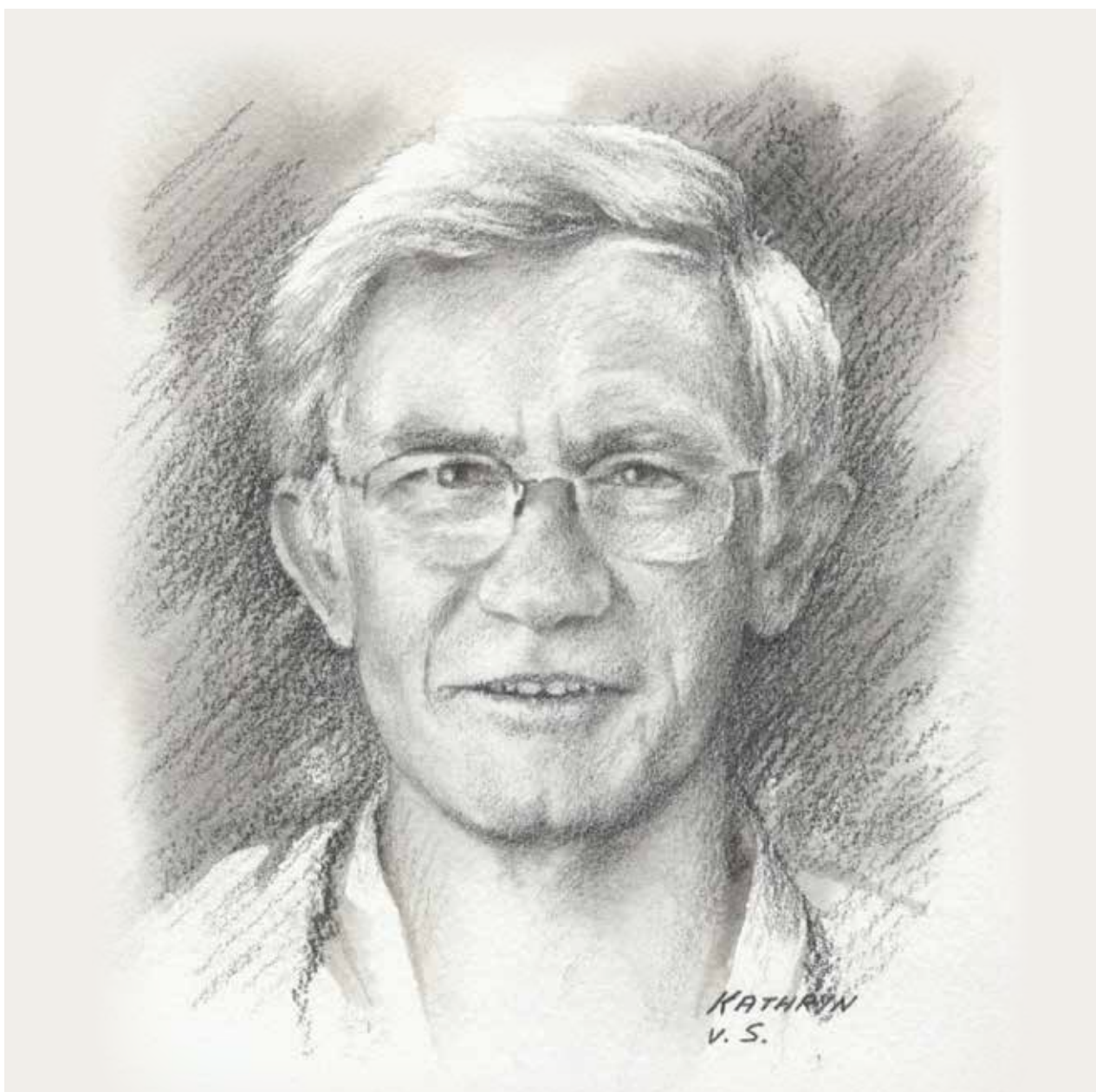
IC 2022 – Photograph: Dale Liebenberg

Traversing the starry skies 2 degrees westwards from epsilon Reticuli, we arrive at a controversial galaxy known as **IC 2022**. During the years 1898 to 1901, DeLisle Stewart was sent by Harvard College Observatory to Arequipa, Peru, to carry out a photographic survey of the southern skies using the Bruce 24-inch refractor. On plate #4184 Stewart discovered a galaxy which was to become IC 2022. He describes the object as “exceedingly small, very extended at a position angle of 5”.

When examining the field on Deep Sky Survey, it showed two galaxies. The western, fainter galaxy matches Stewart’s coordinates and description. The eastern galaxy is much brighter, slightly oval and listed as Fairall 9, also catalogued PGC 14214. This compact object is on the historic plate too, but was viewed as a star by Stewart.

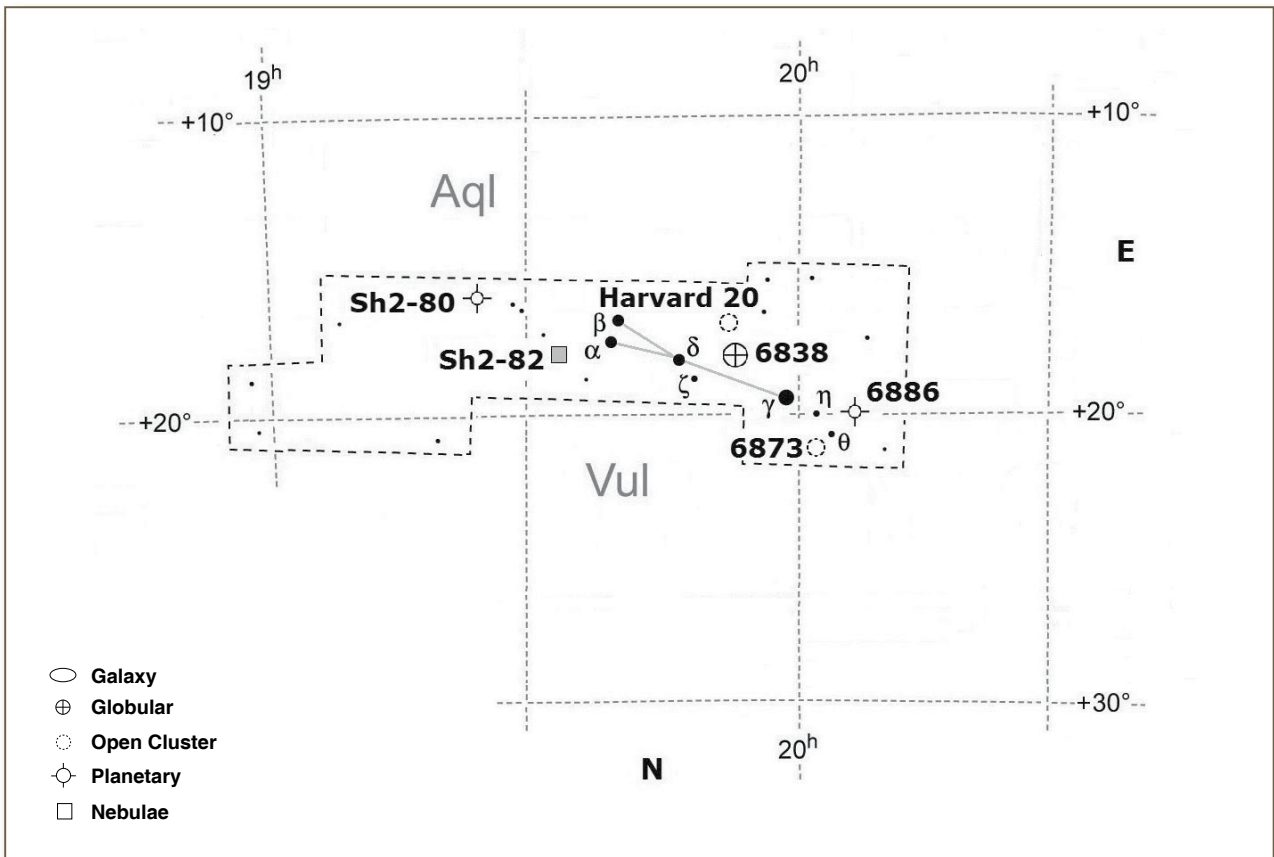
If you need a reticule eyepiece for your telescope you can create one very easily. Make use of very delicate spider web silk to form crosshairs in front of an eyepiece not in use. But if you fear Mister Spider, ordinary silkworm thread, if you can get hold of some, will work just as well!

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 1313	Galaxy	03h18m.3	-66°29'.8	8.7	9.2'×6.9'
IC 2022	Galaxy	03h58m.7	-59°02'.7	14	1.1'×0.2'
Fairall 9 PGC 14214	Galaxy	03h58m.9	-59°03'.7	12.9	1'×1'
NGC 1543	Galaxy	04h12m.7	-57°44'.3	9.7	7.2'×4.9'
NGC 1559	Galaxy	04h17m.6	-62°47'.3	10.4	4.3'×2.2'

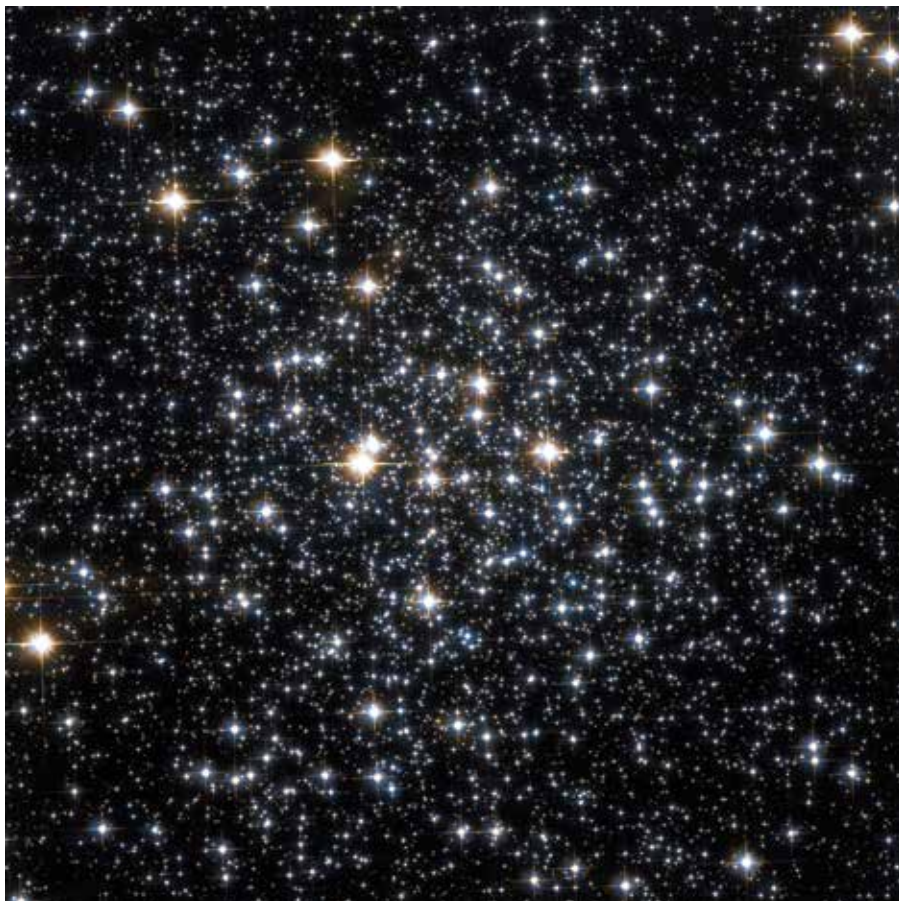


Anthony Patrick Fairall – Pencil Sketch: Kathryn van Schalkwyk

Anthony Patrick Fairall was born 15 September 1943 in London, England. Under the supervision of David Evans, he completed a BSc honours project on Quasars and Quasi-stellar Galaxies in 1966 at the university of Cape Town. He continued his postgraduate studies (PhD) at the university of Texas and completed his (PhD) dissertation on Compact Galaxies in 1970 and then lectured at the newly-formed Department of Astronomy at the University of Cape Town. He started a major photographic survey to find supernovae and compact galaxies in the southern hemisphere and discovered the most luminous active Seyfert galaxy "Fairall 9" named in his honour as a catalogue designation. In 1988 he became director of the renovated Cape Town Planetarium, a post he held for 17 years. Fairall died after a diving accident in Hout Bay, South Africa, on 23 November 2008 (MNSSA, April 2009).



The constellation of Sagitta



NGC 6838 – M71 – Photograph: WikiSky

SAGITTA

Cupid's Arrow

In antiquity it was believed that the strong man and hero Hercules shot off an arrow which is now commonly and popularly known as the Sagitta constellation. The constellation is located in the Milky Way, just north of Aquila and south of Cygnus. The constellation, named during antiquity (and not to be confused with Sagittarius), is one of the smallest at only 4 degrees wide, but in time, with revised demarcation, it has grown to nearly 10 degrees, which still, however, leaves it in the smaller category, but larger than the constellations Equuleus and Crux. It clearly resembles a dart shape, which in softer terms could also be described as the arrow of Cupid, and it does justice to its name because of the exceptional objects within it which are really pleasing to the eye.



The open cluster **NGC 6873** is catalogued as a non-existent object and is situated a degree west of the triple star theta Sagittae with all members in yellow to orange jackets. Such groupings have been described as loose irregular scatterings of faint stars hardly discernible as a star group. The described position is probably also an error; however, the wide double star is catalogued as South 737, with stars magnitude 8.2 and magnitude 9.6 with a separation of 100.8" and position angle (PA) of 129°. James South (1785-1867) was a leading observer of double stars, rivalled only by Friedrich Georg Wilhelm Struve.

The object best known is the globular cluster **NGC 6838**, also catalogued as Messier 71. The object suffers from an identity crisis: it was first seen as a rich open cluster and not in the class of globular clusters. Now known as a young globular cluster, it is poor in metals and does not yet possess any highly evolved RR Lyrae-type variable stars. It is around 10 billion years old and 12 000 light-years distant. It is easily located between the two magnitude 4 stars delta and gamma Sagittae. The first impression is indeed that of a dense open cluster with a brighter middle, not at all the rich core and roundish impression expected with globular clusters. It is irregular in shape; the north-eastern part containing fainter stars with the western part broken down in starlight, causing this uneven shape. With higher magnification the core shows up clumps of faint stars like frosted glass due to the unresolved core stars. Dark patches between the outlier stars of the globular can be picked up with careful observation.

In the north-eastern corner the planetary nebula, **NGC 6886**, can be found 1.7 degrees east of eta Sagittae. There has been much speculation about a dusty green glow that can appear in stars or even nebulae. NGC 6886 resolves the question to some extent. The frosted out-of-focus point was clearly visible to me against the star field and displayed a soft, greenish effect in a way. Although the middle part was brighter, the central star could not be seen. Three stars form a triangle with the planetary towards north, the brighter magnitude 8.6 which has a yellow colour, one in a deep orange and the other star, a pale white colour. The colours of the three stars could explain the possibly only illusory green tint of the planetary nebula. This effect has been described in this object by a good number of amateurs.

Barely half a degree south of M71, the open cluster **HARVARD 20** contains only magnitude 12 to 13 stars. The cluster displays a loosely triangular shape with the more defined point being north. Less than half a degree further south from Harvard 20 is NGC 6839, which has been classified as a so-called non-existent cluster and which I could not really pin-point as a grouping. So, one wonders whether the two do not perhaps have the same address.

More or less in the middle of the constellation we find **Sh2-82**, an emission and reflecting nebula, also known as the little Cocoon Nebula. It may not be that easy to spot through ordinary telescopes, but nevertheless, it appears as two circular hazy patches. The southern patch is larger and brighter, and perhaps the only part that can be seen, with a great amount of luck. A magnitude 7.4 star accompanies the nebula on its immediate eastern side.

Less than a degree north-east from delta Sagittae, which forms the split end of the Sagitta pattern, is the multiple star zeta Sagittae. The AB, a close pair, appears slightly yellowish with the C companion blueish, easily spotted with small telescopes. The D companion with a magnitude of 10 is 76" away at a position angle (PA) of 247°.

Merrill's star, and its planetary nebula also known as **Sh2-80** which is situated in the south-western part of Sagitta close to the border with Aquila. It is a Wolf-Rayet star surrounded by a ring (photographically) of expelled material, and one of the fastest runaway stars in the galaxy. Kent Wallace, a well-known personality in astronomy circles, sees a vague brightening around the star with an H-beta filter, which would be in line with the shell's low excitation.

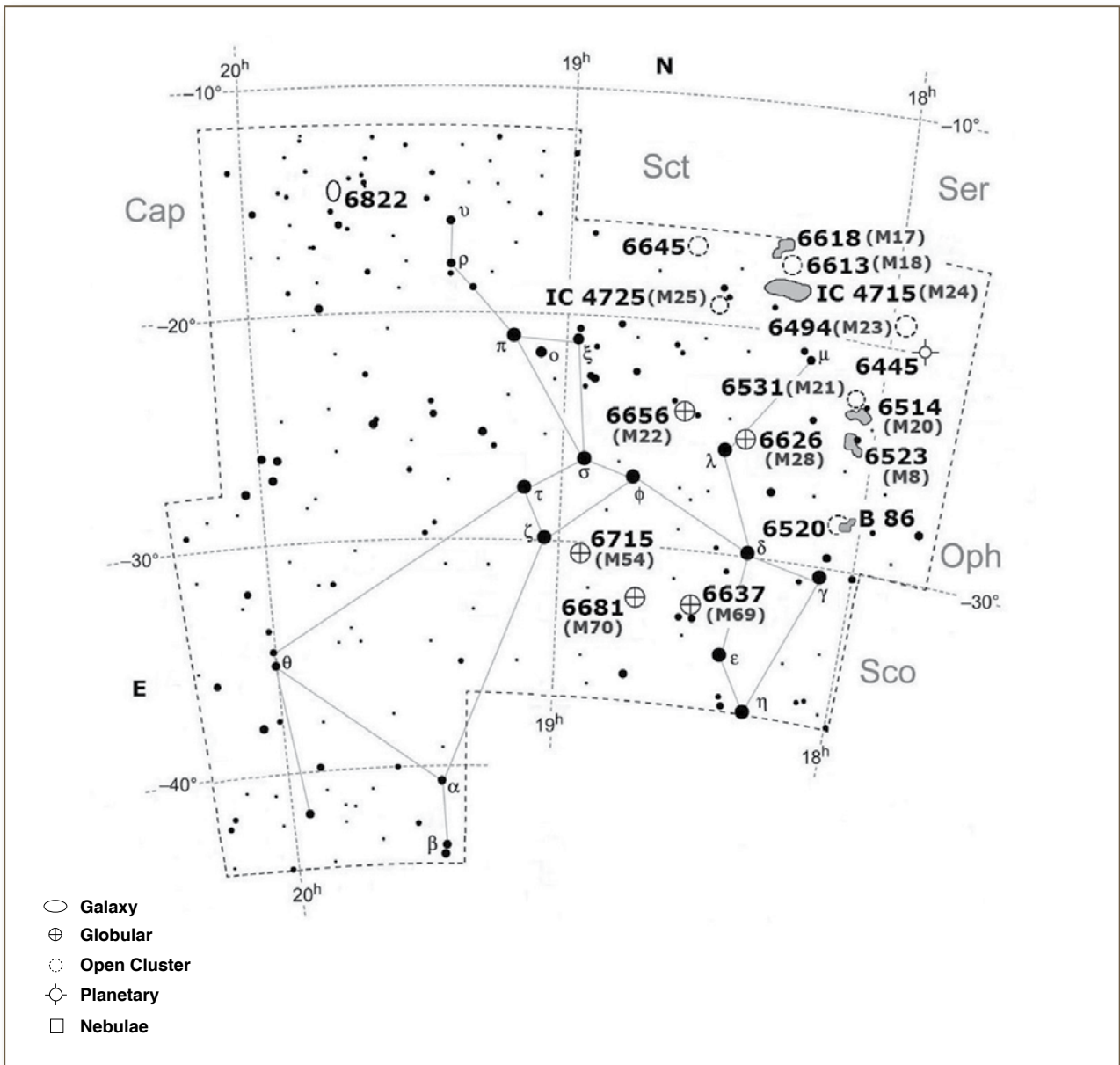
Paul Willard Merrill was an American astronomer whose specialty was long-period variable stars, using spectroscopy. He was the first to define Type-S stars, in 1922. He received his PhD at the University of California in 1913. He also studied the interstellar medium, including the diffuse interstellar bands and succeeded in detecting technetium in the variable star R Andromedae and other red variables. Since technetium has no stable isotopes, it must have been produced recently in any star in which it is found, and this is direct evidence of the S-process of nucleosynthesis. He spent the bulk of his career at Mount Wilson Observatory, from which he retired in 1952.



Paul Willard Merrill – Pencil Sketch:
Kathryn van Schalkwyk

Sagitta's arrow is unwaveringly aimed towards the exceptional objects described, making some of them fairly easy to locate.

OBJECT	TYPE	RA	DEC	MAG	SIZE
Sh2-80	Nebula	19h11m.5	+16°51'.7	14	81"
Sh2-82	Nebula	19h30m.3	+18°16'.6	11	6'
HARVARD 20	Open Cluster	19h53m.1	+18°20'.3	7.7	8'
NGC 6838 Messier 71	Globular Cluster	19h53m.8	+18°46'.8	8.2	9'
NGC 6873	Open Cluster	20h08m.3	+21°06'.0	6.4	12'
NGC 6886	Planetary Nebula	20h12m.7	+19°59'.4	12.2	7"



The constellation of Sagittarius



NGC 6559 upper left, NGC 6523 – M8 – NGC 6514 – M20 and NGC 6531 – M21 to the upper right. Photograph: Oleg Toumilovitch

SAGITTARIUS

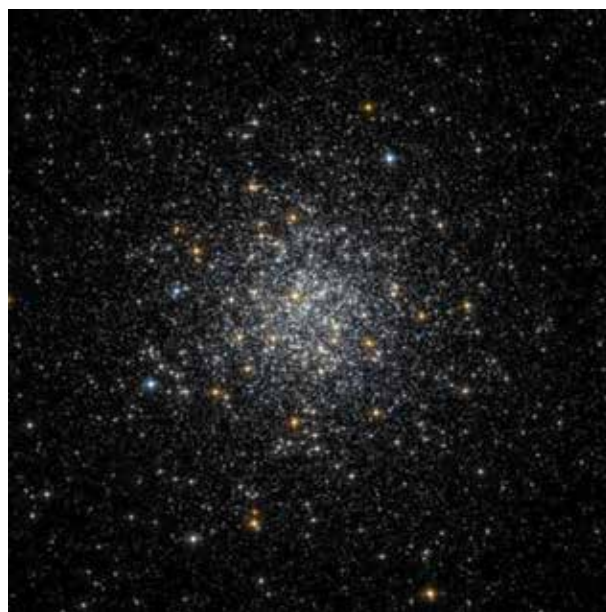
Discover the Soul of Messier

The Milky Way commands the southern winter skies, softly spreading its hazy star-cloak against the dark sky. It is then that I know without any doubt that Charles Messier the French astronomer must have had an all-encompassing love for the night sky. I wonder about his thoughts as he perched on the top of the Hotel de Cluny, in Paris, France, pointing his telescope into the rich Milky Way region filled with the most wonderful deep sky objects. Although Messier searched the night sky for comets, these nebulae and clusters must have made a big impression and have left a life-long memory. Let us join Messier and take up this southern winter tour into the heart of the Milky Way.

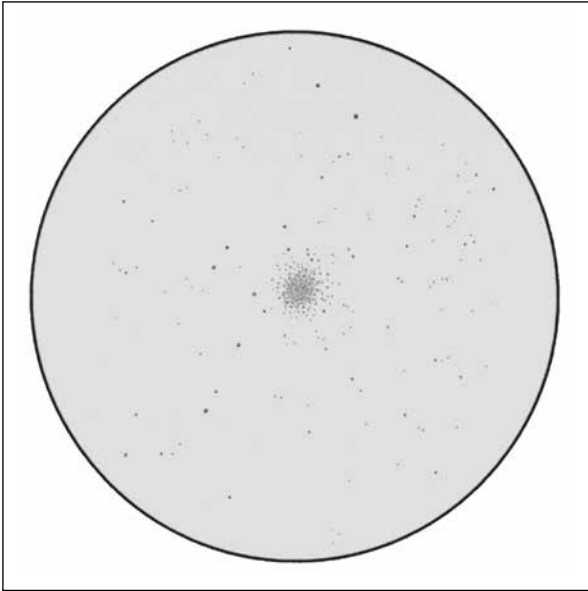


The great and famous Sagittarius Star Cloud **IC 4715**, also known as Messier 24, is a compact star rich cloud-like area, approximately 600 light-years wide, which was discovered by Charles Messier in 1764.

NGC 6637 also known as Messier 69, is visible with the naked eye 2.5 degrees north-east of epsilon Sagittarii in the belly of the Sagittarius teacup asterism. Set against a rich star field, M69 appears as a tiny fuzz ball at first. Careful observations, however, show a scattering of faint star-splinters on its surface. With even higher magnification the object reveals an uneven wide middle area, which shrinks with averted vision to a pin-point core. A magnitude 8 star is situated on the globular north-western edge. Messier, who discovered the object in August 1780, was not the only one to see its resemblance to a comet – the French astronomer Nicolas Louis de Lacaille described it as similar to “the small nucleus of a comet”.



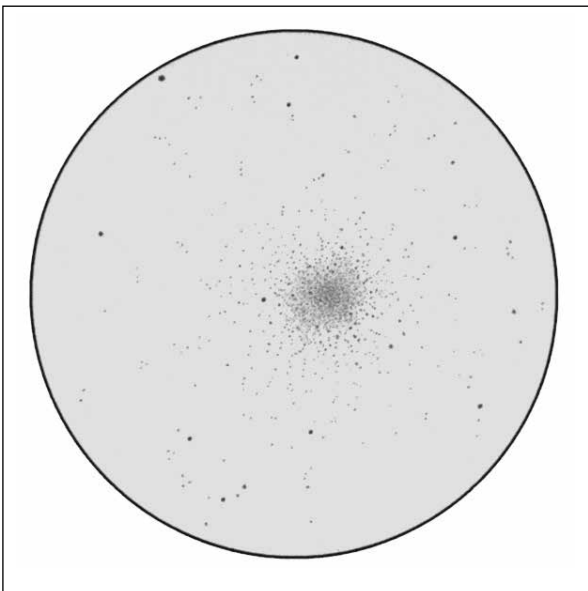
NGC 6637 – M69 – Photograph:
astronomyconnect



NGC 6681 – M70 – Globular Cluster

Wander 2.5 degrees further east down the globular alley to yet another globular cluster, **NGC 6681** also known as Messier 70 and situated between epsilon and zeta Sagittarii the smallest and faintest of the Messier globular clusters. The globular shows a small concentrated star-like core in the midst of a hazy bubble. High magnification reveals an impression of sandpaper over a prominent core. Brighter stars and a very obvious star chain can be seen towards the north-eastern edge. What a moment this must have been for Messier, when he discovered this object in 1780 in the same night as M69!

NGC 6715 also known as Messier 54, is situated 1.7 degrees west of zeta Sagittarii, more distant than its neighbours, but famous for its association with the Sagittarius Dwarf Elliptical Galaxy. It is also the farthest of all the Messier globular clusters at a distance of nearly 70 000 light-years. M54 shows up as a blazing light with a large compressed core and a wide outer hazy halo with no stars resolved.



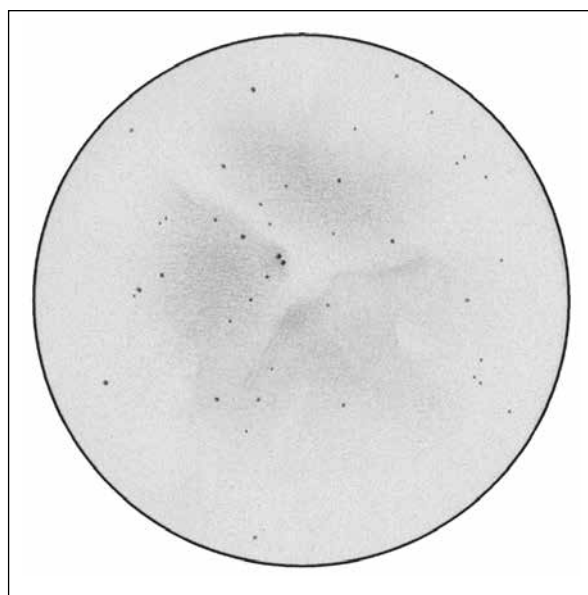
NGC 6656 – M22 – Globular Cluster

The star marking the lid of the teapot asterism, magnitude 2.8 lambda Sagittarii, puffs out two Messier globular clusters. **NGC 6656** also known as Messier 22, has all the characteristics of a true showpiece globular cluster. It is a well-resolved dense object sprinkled with starry dust. The uneven, bright middle reveals a very dense compact star-rich core. Vague dark lanes and short strings of stars fight their way out into the field of view. If I could only discuss the impression of M22 with Mr. Messier, I would say "Charles, don't you think this is the diamond in the starry crown?".

NGC 6626, also known as Messier 28, is located just a degree north-west of lambda Sagittarii, a beautiful golden coloured star. Although this globular cluster is small in size it shows a very dense core embedded in a halo of resolved faint stars. High magnification reveals numerous star chains, like flimsy lace, which spread out into a pleasing display.

Let your eyes slowly follow the intense complex of bright nebulosity containing Messier 8 and Messier 20 situated west of the teapot's lid-star lambda Sagittarii. The entire field of view around **NGC 6523**, also known as Messier 8 is bathed in flimsy nebulosity. Known as the Lagoon Nebula it is being cut down towards the middle area by a curved dark lane, showing the brighter part of the nebula to the west. Embedded in this nebula and responsible for its light, is the very hot magnitude 6 star known as 9 Sagittarii.

NGC 6514 also known as Messier 20 is a beautiful and spectacular nebula, one of 15 Messier objects in the constellation Sagittarius. What makes the Trifid Nebula special (named by John Herschel), are the three dark dust lanes that join together in the centre of this lovely small cloud, showing off a nice double star on the tip of the brighter eastern lobe. The western part of the inner dark lane is well defined and even displays a little notch with higher magnification. The northern section of the nebula is slightly flimsier and extends further with a tail-end ray of stars to intervene with the open cluster

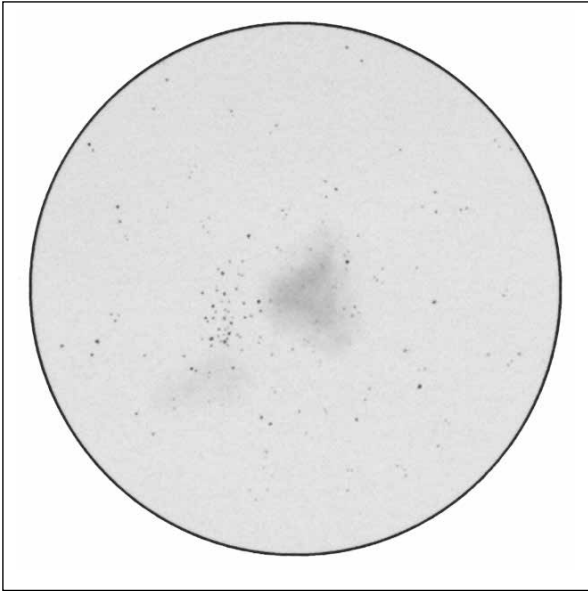


NGC 6514 – M20 – Nebula

NGC 6531 also known as Messier 21. The character in this open cluster is very special and unusual. In a way it resembles a curled-up seashell starting to unwind from a pair of magnitude 8 stars.

NGC 6494 also known as Messier 23 is a massive globe of faint stars, quite large and pleasing to the eye. The members are evenly distributed with a few dark spots around the middle part. Messier discovered this stunning group of stars in June 1764.

The open cluster **IC 4725** also known as Messier 25, is clearly divided by an uneven dark lane from east to west which cuts the group of stars into two parts. The northern part contains brighter stars with a yellow coloured magnitude 6.7 as the leader.



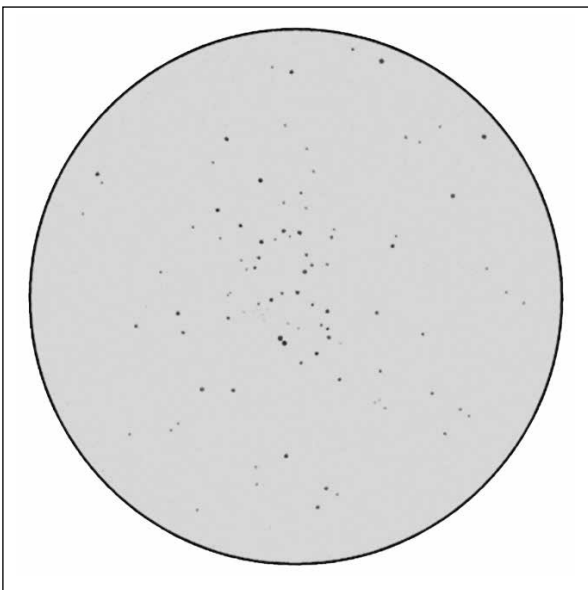
NGC 6520 – Open Cluster and Nebula

NGC 6520, the open star cluster and dark nebula **B86**, exhibits an unusual contrast that can truly be classified as one of the Milky Way jewels. The cluster is well defined and displays the blue-white stars of its youthfulness a mere 8.5' east of the dark nebula, which in all likelihood formed part of the cluster's development process. It is not difficult to spot the dark nebula through an ordinary telescope, which displays hazy roundish edges with a flimsy part stretching out to mingle with the south-western part of the cluster.

B86 is composed of cold gas and a small amount of dust. Pictures taken with the Gemini Multi-object spectrograph show it in a sort of a gecko figure. It is believed to contain enough material to create a few thousand suns like our own. Both the objects are approximately 5000 light-years distant, with the galactic centre five times further away. In some ways the dark nebula resembles a top hat, almost box-shaped, with its brim cut off towards the north-west, as seen against the background star field. In combination, these two objects display the proverbial pitch black and snowy white.

The planetary nebula **NGC 6445** can be found in the far western part of the constellation. It has an elongated shape in a north-west to south-east direction with no sharp edges. The northern part is slightly brighter than the southern part with a small halo towards the centre giving it a sort of dumbbell shape.

A soft envelope surrounds the planetary, which displays a grey-white colour.



NGC 6645 – Open Cluster

NGC 6645 is an open cluster with a difference. The stars in this group create two separate ovals bubbling out towards the western side. This cluster is very pleasing to the eye.

The famous dwarf elliptical galaxy **NGC 6822** is situated in the north-east of the constellation and discovered by Edward Emerson Barnard. The more popular name, Barnard's Galaxy, was a tribute to this unique man, who found this galaxy visually with a 6-inch refractor on 17 August 1884. It is quite a prominent, bright north to south oval-shaped galaxy barely brighter towards the centre. A mass of faint stars covered the surface.

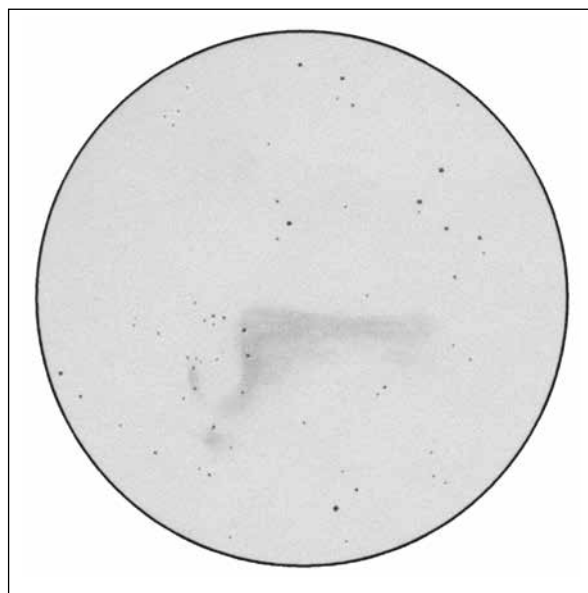


NGC 6822 – Photograph: Dale Liebenberg

IC 1308 one of the brightest nebulae inside the galaxy can be glimpsed on the northern boundary. When observing, I let my mind ponder over Barnard's Galaxy with a million thoughts about this man who has been called one of the greatest observers of all time.

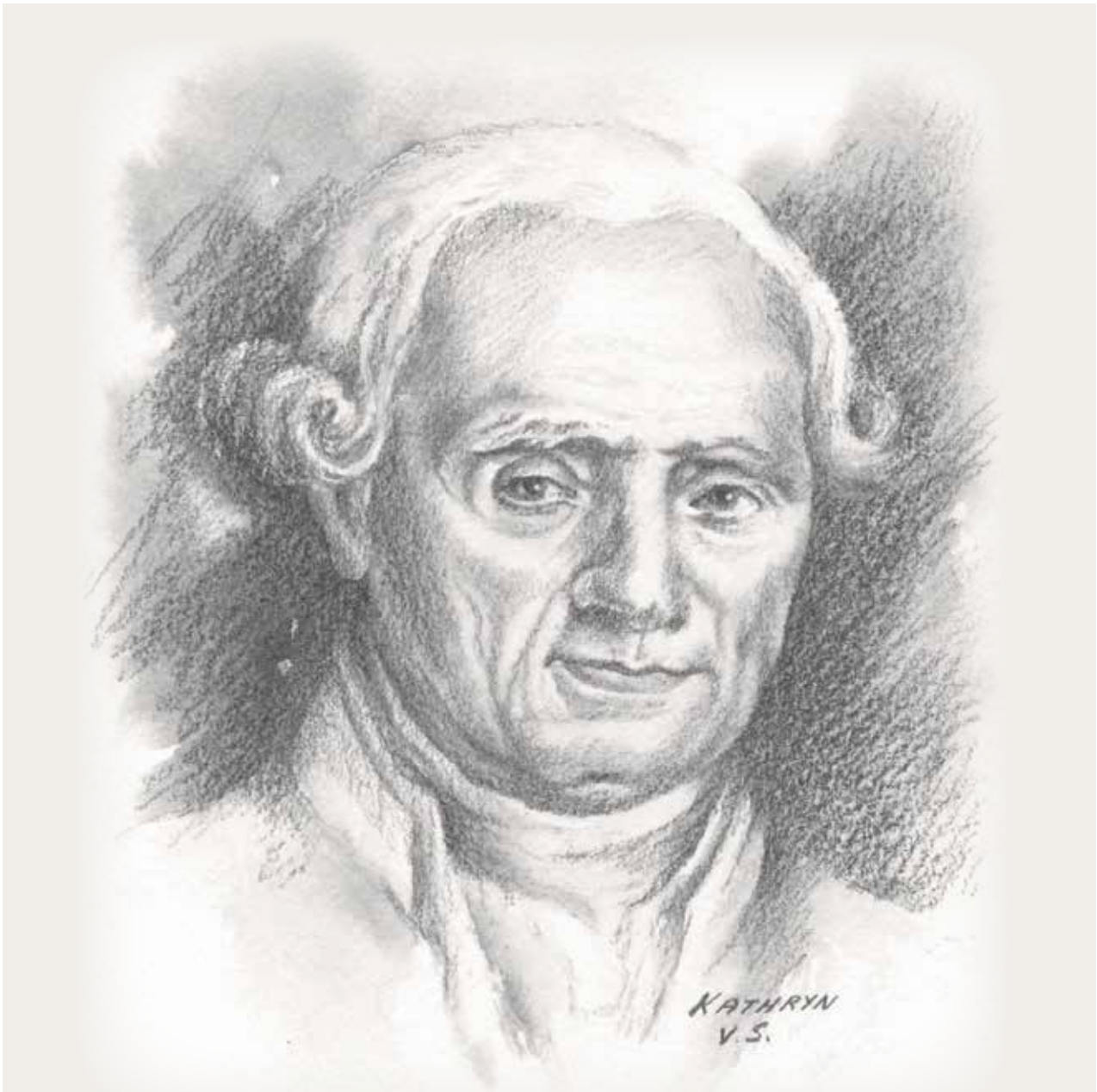
Follow the curve of the Milky Way northwards to discover more Messier objects. **NGC 6613** also known as Messier 18, can be seen as a coarse cluster of around 15 beautiful white stars quite well-defined against the star field. The group can even be spotted through binoculars.

Further north and virtually on the border with the constellation Serpens **NGC 6618** also known as Messier 17 and be found, popularly known as the Swan Nebula, also Omega Nebula, the names created by John Herschel. The northern section of M17 is well defined against the background in contrast to the southern wispy elongated hazy part. The extreme western part however is quite impressive; it shows the elegance of the Swan's neck with a sprinkling of faint stars. Messier noted; "the splendour of this bright elongated east to west glow has the perfect ray or tail of a comet".



NGC 6618 – M17 – Nebula

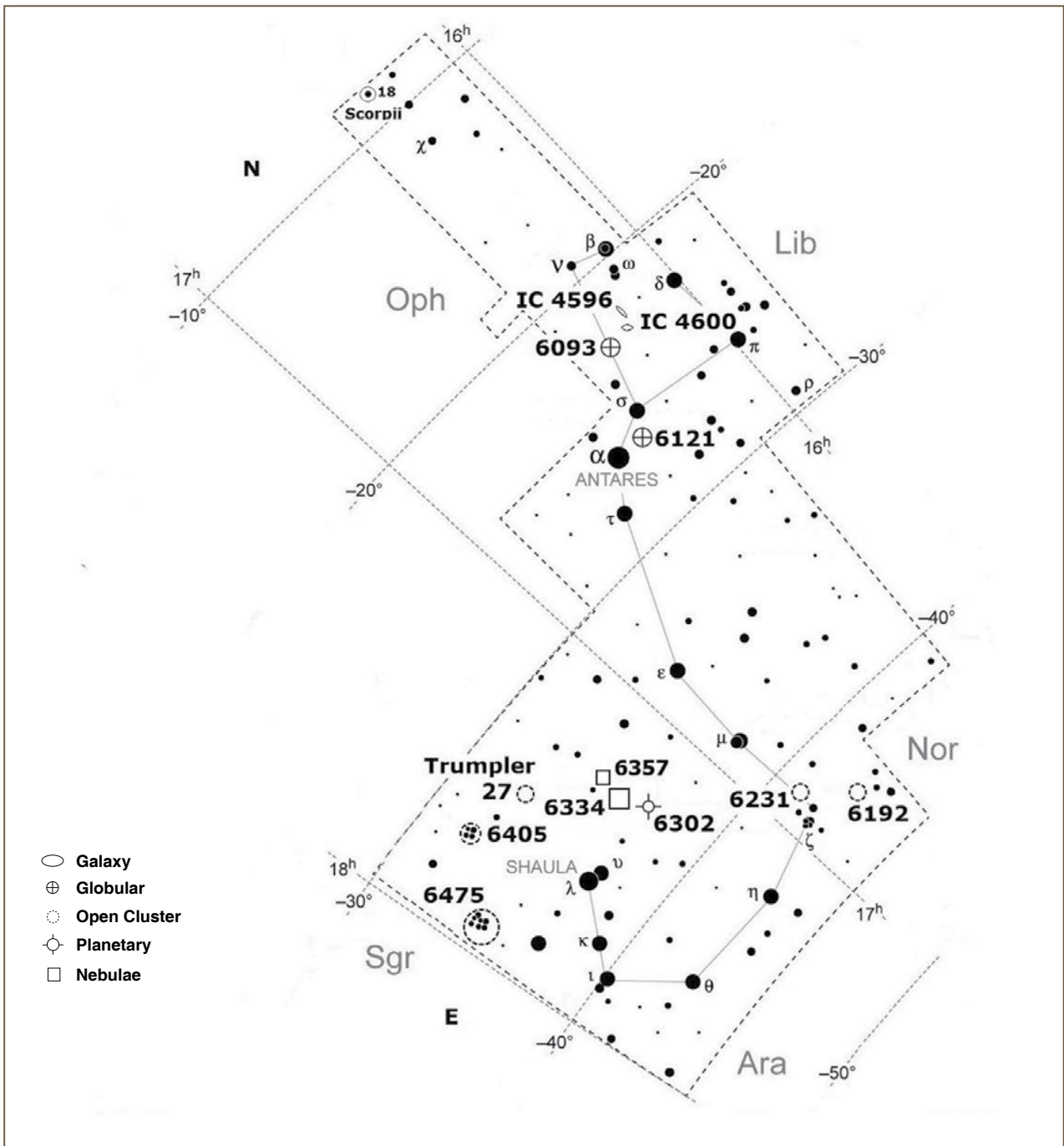
After such a wonderful observing session, I usually move away from my telescope and slowly let my eyes follow the hub of the Milky Way, drinking in the wonders of our home galaxy, and thinking what it would have been like to share these treasures with the Frenchman: "Magnifique, Charles, Magnifique!".



Charles Messier – Pencil Sketch: Kathryn van Schalkwyk

Charles Messier (1730–1817) was born in Badonviller, an independent state on the border between France and Lorraine, which France annexed in 1766. Messier's interest in astronomy was stimulated by the appearance of the great six-tailed comet in 1744 and by the annular solar eclipse visible from his hometown on 25 July 1748. Messier was made a fellow of the Royal Society in 1769, and was also elected a foreign member of the Royal Swedish Academy of Sciences. He was elected to the French Academy of Sciences in 1770. Messier devoted much of his life searching the skies for comets. The French comet-hunter published a catalogue with 110 objects referred to by an "M" (Messier), followed by its number.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6445	Planetary Nebula	17h49m.2	-20°01'.0	11.2	34"
NGC 6494 Messier 23	Open Cluster	17h56m.8	-19°01'.0	5.5	25'
NGC 6514 Messier 20	Emission and Reflection Nebula	18h02m.3	-23°01'.7	6.3	20'
BARNARD 86	Dark Nebula	18h03m.0	-27°53'.0	-	5'
NGC 6520	Open Cluster	18h03m.4	-27°54'.0	7.6	6'
NGC 6523 Messier 8	Diffuse Nebula	18h03m.8	-24°23'.2	4.6	35'
NGC 6531 Messier 21	Open Cluster	18h04m.6	-22°30'.0	5.9	13'
NGC 6613 Messier 18	Open Cluster	18h19m.7	-17°08'.0	6.8	9'
NGC 6618 Messier 17	Emission Nebula	18h20m.8	-16°10'.6	6	20'×15'
NGC 6626 Messier 28	Globular Cluster	18h24m.5	-24°52'.0	6.8	11.2'
NGC 6637 Messier 69	Globular Cluster	18h31m.4	-32°20'.8	7.6	7.1'
IC 4725 Messier 25	Open Cluster	18h31m.6	-19°15'.2	4.6	28'
NGC 6645	Open Cluster	18h32m.6	-16°53'.1	8.5	10'
NGC 6656 Messier 22	Globular Cluster	18h36m.4	-23°54'.2	5.1	24'
NGC 6681 Messier 70	Globular Cluster	18h42m.2	-32°17'.5	7.8	8'
NGC 6715 Messier 54	Globular Cluster	18h55m.1	-30°28'.7	7.6	9.1'
NGC 6822	Galaxy	19h44m.9	-14°48'.0	8.8	19'×15'



The constellation of Scorpius

SCORPIUS

The Winter Bug

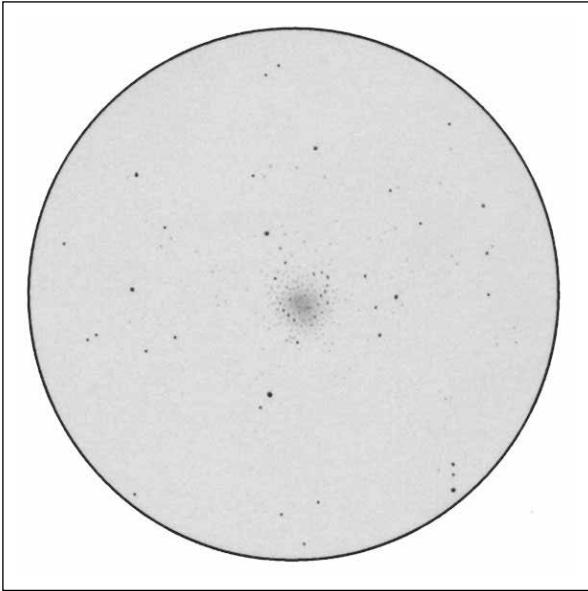
With a slightly tilted appearance, as if just beyond our line of vision, the Milky Way shows off its soft, downy blanket in a way that defies human comprehension and description. Most of us who are fascinated with the night sky most probably cherish a favourite constellation. It might be a favourite time of the year for observation, a special memory, or a constellation with an exceptional form.



It can be a bit tricky to connect constellation shapes with their names, however most of us, will agree that Scorpius is one of only a handful of constellations that can wear its name with pride and I believe that it might be a favourite for most of us.

A solar twin is most probably the star 18 Scorpii, which is a dead ringer for our sun and only 46 light-years away. It is only five percent more luminous than the sun, slightly older and similar to our home star in iron abundance. It is situated in the far northern part of Scorpius, virtually on the border with the constellation Ophiuchus.

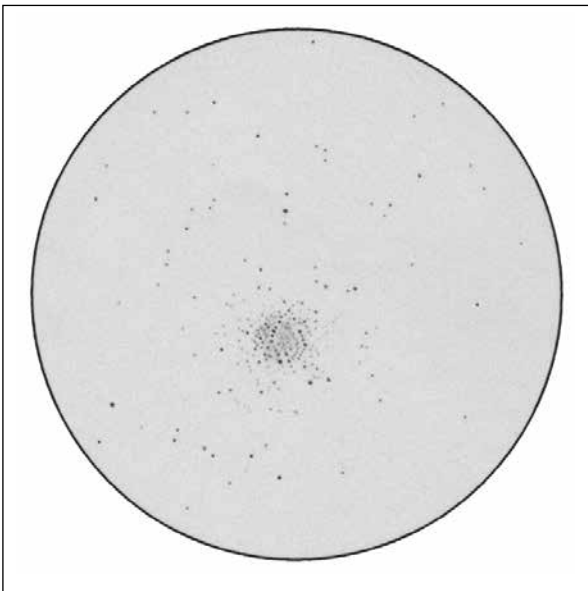
The heart of the constellation can be visualized by focusing on alpha Scorpii, or perhaps better-known as Antares. This red giant is the 15th most brilliant star in the sky and approximately 320 000 000 kilometres in diameter. It is a double star but the companion cannot easily be seen due to Antares' blinding glare. However, it is not impossible. With lots of persistence and courage, and the help of a green filter, I was able to observe it positively, in a position angle of (PA) 275° a few years ago. It was a difficult observation visually done in pristine dark night skies with a cloth over my head to be protected from stray lights.



NGC 6093 – M80 – Globular Cluster

Globular clusters are always a preference to observe and Scorpius is home to a few noteworthy examples. **NGC 6093** also known as Messier 80 is worth a visit and found its home 4.4 degrees north of the star alpha Scorpii. The globular cluster displays a rather roundish glow with a bright dense core.

Although it is rare to find galaxies in the Milky Way and particular in Scorpius, the two galaxies **IC 4600** and **IC 4596**, which are extremely faint, share the star field just north-west of M80.



NGC 6121 – M4 – Globular Cluster

NGC 6121, also known as Messier 4, is a jewel globular cluster and nestles snugly against the Scorpius heart, only 1.3 degrees west of alpha Scorpii. Also known as Bennett 75, it is a showpiece globular cluster of well-resolved bright stars that are scattered towards the edges and gradually brightens towards an outstanding core. M4 shows off a variety of nearly three-dimensional star-strings that mingle with a slightly gaseous field of view. A relatively straight line of stars, cutting across the middle part from north to south, is striking. Another lovely string, together with clumps of

faint and coloured stars, swings out on the southern side of the globular, giving it a slightly oblong appearance. M4 is on the limit of naked-eye visibility in very dark skies.

There is an Alley Cat to be seen in the star shape of the open cluster **TRUMPLER 27**, which is situated in the far eastern part of the constellation. The stars that indicate the head of the cat-shape are also the brightest and on the western side of the grouping. It is always fun to discover the different shapes that open clusters can bring to the over-active mind.

Open clusters can exist in all shapes and sizes and a few unique ones share a home with Scorpius. The stars in the group **NGC 6405** also known as Messier 6 are commonly known as the Butterfly Cluster, and the group has all the right in the world to claim the name. This outstanding cluster is situated in the far north-eastern part of the constellation and is beautiful, very bright, irregular and spacious. The group contains some of the most beautiful star string-arches, curls and dark lanes. Flying its stars in a north-west direction the group with two short strings indicate the antennae projecting towards the north-western edge. Two rows of stars around 5' in length on both the north-eastern and south-western ends can be seen as the stretched out delicate wings of an imaginary butterfly.



NGC 6405 – M6 – Photograph: Leslie Rose

In the northern part of South Africa, the mopani butterfly can be found and it has two lovely large yellow dots on both wings. But, our starry butterfly Messier 6 has only one yellow dot in the north-eastern part, projected by the bright magnitude 6 yellow coloured BM Scorpii, a semi-regular variable. Don't miss the butterfly!



Mopani butterfly – Photograph: Wikimedia

The naked eye cluster **NGC 6475** better known as Messier 7 can be seen 3.8 degrees south-east of Messier 6. Both the clusters are visible to the naked eye and even more stunning through binoculars.

The double star mu Scorpii literally rides the back of Scorpius, and points the way to **NGC 6302**, situated only 4.4 degrees to the east and aptly named the Bug Nebula, carries its nickname well. Slightly elongated in a north-west to south-east direction, it can easily be mistaken for a galaxy. The north-western part displays a curly wispy extension, which reminds me in a way of spider's legs. About half way along the swing extension is a relatively bright knot of nebulosity. The north-eastern part, although flowing, is fatter in shape.

NGC 6334 is a nebula that lives up to its nickname of the Cat's Paw or Bear Claw Nebula, situated just north-east of NGC 6302. The nebula is divided by dark lanes to form four separate pieces of nebulosity, around 5500 light-years away. NGC 6334 is a complex emission nebula in combination with ultraviolet radiation, and pictures taken with large telescopes show this huge nebula glowing with a red colour due to an abundance of ionised hydrogen.



NGC 6334 – NGC 6357 – Photograph:
Dieter Willasch

Dark skies are essential to bring this wonderful object to the fore and with the help of filters it is not that difficult to observe the three paws, footprint look-alike of a real-life big cat, if you wish. The south-eastern piece, which represents the front "toe", is also the largest and most outstanding, with the other two situated to the east and west. With careful observation a little piece of haze can be seen towards the centre between the different pieces of nebulosity. The delicate hazy section extends further towards the north with faint stars embedded. Beware of the cat in the dark of night, but try to spot his footprint against the stars. Towards the north-eastern field **NGC 6357**, the Lobster Nebula finds a home in this sea of faint stars.

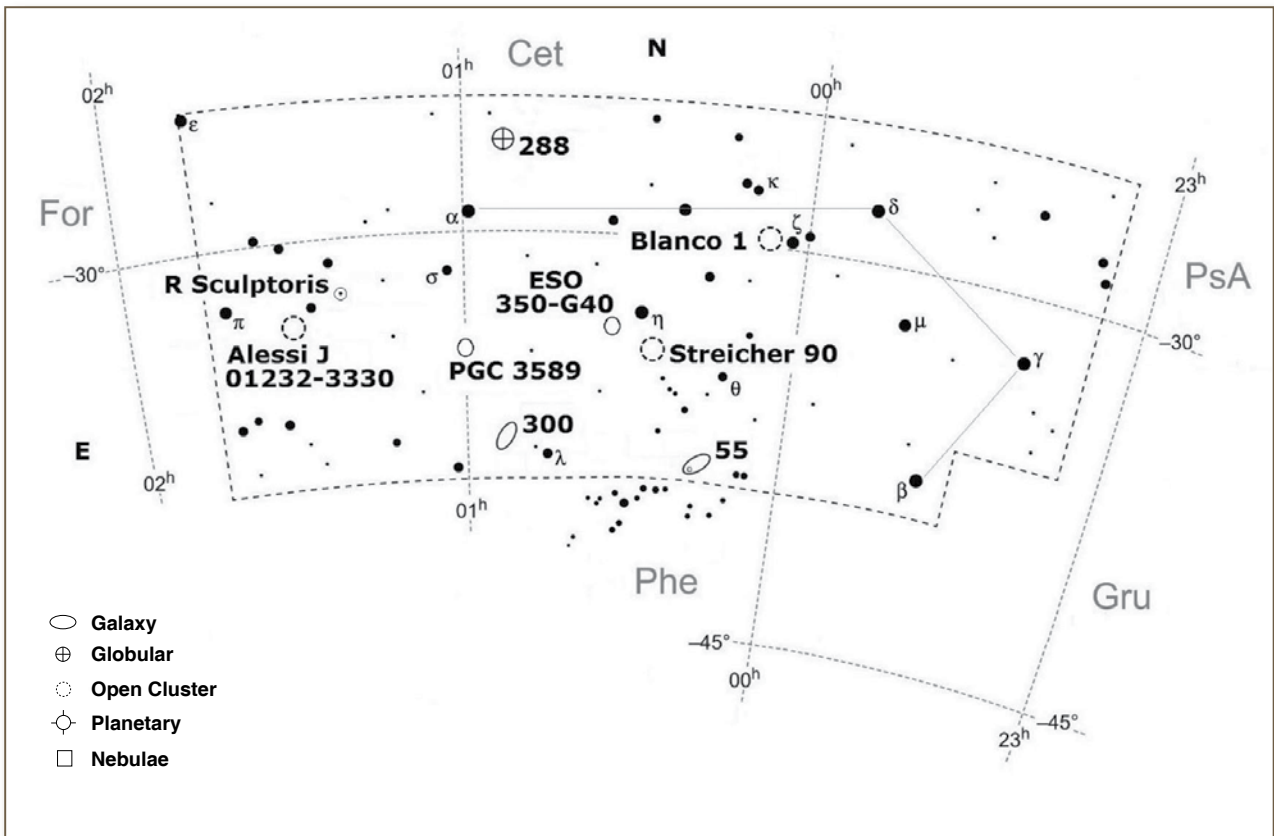
Further east is the well-known stinger-star Shaula or lambda Scorpii, which in combination with upsilon, kappa and iota, was also known as the rabbit tracks to the Navajo people in ancient times.

The bright open cluster **NGC 6231**, can be found as a partner of zeta Scorpii and displays scattered faint and bright stars in curls and strings. The cluster is one of the most beautiful and outstanding in a lovely star field. The grouping is slightly more concentrated on the north-western side, with mixed magnitude stars stretching further north to mingle with the clusters Collinder 316 and Trumpler 24 covered in nebulosity. The area is sometimes referred to as Halley's False Comet, or the Table of Scorpius. John Herschel wrote as follows: exactly like Halley's comet. Well, to the naked eye zeta Scorpii form the impression of a comet nucleus and the clusters the hazy tail. Halley mention NGC 6231 as seen from St Helena the island where he stayed off coast from Cape Town. Could it be that NGC 6231 is "Halley's False Comet", with Scorpius over Table Mountain?

The open star cluster **NGC 6192**, is situated 3 degrees south-west from NGC 6231. It is a pretty, loose, open cluster, slightly elongated north to south with a selection of about 60 mix-magnitude stars broken into smaller groups. This is an appealing group that displays, in a unique way, a wealth of detail in its shape. The inner section is rich in stars, with short strings that mingle well with the busy star field. The northern side of the cluster's field of view is rather poor in starlight. Seeing that we are into bug alley, the stars resemble a tick-like figure or even a small baby scorpion impression. The upright star-tail projects quite prominently in a south-east direction increasing its overall size to about 10' in size.

Brace yourself against the southern winter cold and explore the constellation Scorpius (fortunately not a live one!). I must confess, that alone under the southern winter starry sky, my imagination sometimes plays tricks with me when I hear crackling noises. My consolation comes with the thought that some insects are normally in winter hibernation!

OBJECT	TYPE	RA	DEC	MAG	SIZE
IC 4596	Galaxy	16h16m.3	-22°37'.5	14	1.5×0.5'
IC 4600	Galaxy	16h16m.5	-22°47'.0	15	0.4×0.3'
NGC 6093 Messier 80	Globular Cluster	16h17m.0	-22°59'.0	7.3	8.9'
NGC 6121 Messier 4	Globular Cluster	16h23m.6	-26°32'.2	5.8	26.3'
NGC 6405 Messier 6	Open Cluster	17h40m.1	-32°13'.0	4.2	33'
NGC 6475 Messier 7	Open Cluster	17h53m.9	-34°49'.0	3.3	80'
NGC 6192	Open Cluster	16h40m.3	-43°22'.3	8.5	7'
NGC 6231	Open Cluster	16h54m.0	-41°48'.0	2.6	14'
NGC 6302	Planetary Nebula	17h13m.7	-37°06'.0	9.6	50"
NGC 6334	Emission Nebula	17h20m.4	-35°51'.8	7+	35'
NGC 6357	Emission Nebula	17h24m.7	-34°12'.2	8+	22'
TRUMPLER 27	Open Cluster	17h36m.2	-33°29'.3	6.7	6'



The constellation of Sculptor



A real masterpiece of bronze Cheetahs in the hands of the sculptor Gill Wiles

SCULPTOR

The Sculptor's Feast in Art

The constellation Sculptor is situated between Cetus to the north and Phoenix to the south. The name dates back to 1754 when the astronomer Nicolas Louis de Lacaille named the constellation, the last of the 88 constellations now recognized. It was originally called "L'Atelier du Sculpteur", (the Sculptor's Workshop) in French. However, I like the German version "Bildhauerwerkstätte", it just says it all.



With a bit of imagination, it is just possible to see the bowed head of a sculptor, possibly busy creating a masterpiece.

What certainly is true, though, is that Sculptor contains masterpiece objects. Let us now follow the route of the chisel through the constellation, which appears faint but shows off its objects with pride.

The western part of the constellation is characterised by magnitudes 4.4 gamma, 4.3 beta and 4.5 delta. However, many of its objects described in this chapter are situated more towards the middle area of the constellation.

A mere 3 degrees south-east of delta Sculptoris is **BLANCO 1**, discovered in 1949 by Victor Blanco - a very large, sparse, open cluster centred around the magnitude 5 zeta Sculptoris. This area boasts a wealth of bright stars that can yield excellent observation results with binoculars. Approximately 6 degrees further south-east is the magnitude 4.8 eta Sculptoris, very conveniently located in the central area of the constellation.

Open star clusters in this constellation are somewhat scarce, requiring me to fall back on my list of asterisms. **STREICHER 90** can be found about 2.2 degrees south of eta Sculptoris. A group of more than a handful can be picked out against the fainter star field. Six of them are evenly spaced in a north-west to south-east direction in perfect symmetry, with a further few stars to the north spoiling this shape to some extent. Most of the stars display colours that vary from buttery-yellow to orange.



STREICHER 90 – Photograph: DSS



ESO 350-G40 – Photograph:
APOD-NASA

The Sculptor constellation harbours a huge number of galaxies. One of them situated 2 degrees east of eta Sculptoris is **ESO 350-G40**, better known as the Cartwheel Galaxy, was found by Fritz Zwicky in 1941, with the second name Zwicky's Ellipse. This ring galaxy displays a special appearance and is around 500 000 light-years distant. Under the ideal conditions of a dark bushveld starry skies, I made a desperate attempt to

glimpse this rare object. The only way was to sketch the complete star field. The galaxy could barely be seen with averted vision as a very faint, extremely small out-of-focus hazy light. A mere 6' north is a pair of magnitude 13 stars, which most conveniently points the way, making this task slightly easier. Comparison with star-maps afterwards showed that I was right on target. But just like that perfect image chiselled out by the sculptor, this special object is distinctive which, as photographs show, forms an open wheel with a bright hub that truly justifies its name. The galaxy probably came into being as a result of a direct collision with a satellite galaxy, causing a blue ring of infant stars.



PGC 3589 – Photograph: phys.ttu.edu

The very faint galaxy **PGC 3589** was the first dwarf galaxy to be discovered in our local group of galaxies, and situated in the south-eastern part of the constellation. Also known as The Sculptor Dwarf Galaxy, it was found by Sylvia Lindsay, working for Harlow Shapley at Boyden Observatory in South Africa at the time. At a distance of 300 000 light-years, it was possible to study the proper motion of this system quite successfully. The Sculptor Dwarf contains only 4 percent of the carbon and other heavy elements found in our own galaxy, the Milky Way, making it similar to primitive galaxies seen at the edge of the universe.

Sculptor is home to exceptional objects and presents a surprise with the very special magnitude 6.8-star R Sculptoris. It is a scarlet carbon Mira-type star that can be seen approximately 1.5 degrees north-east of the galaxy NGC 597. With a variable period of 207 days, ranging between magnitudes 9 to 12.8, it is one of the most brilliant red coloured stars in the night sky.

One of the most interesting galaxies can be found on the border between Sculptor and Phoenix. **NGC 55**, is a splendid edge-on galaxy with a lot of character, and very elongated in a north to south direction. The core is bright and stands out but seems to be off-centre towards the north-western thicker part. A few faint stars can be seen on the hazy surface. NGC 55 shows some structure two-thirds of the way down the south-eastern part, where the galaxy tapers down and appears slightly broken off, surrounded in nebulosity. This broken part is also host to a small hazy patch which has been catalogued as IC 1537. The object gives the impression of a shuttle with its plume of smoke just off its main body. James Dunlop was fortunate enough to be the discoverer of this galaxy, which he recorded as a beautiful long nebula. I sometimes wonder what ancient secret this exceptional galaxy harbours, slowly and leisurely creating a work of art, forming it into this unique shape.



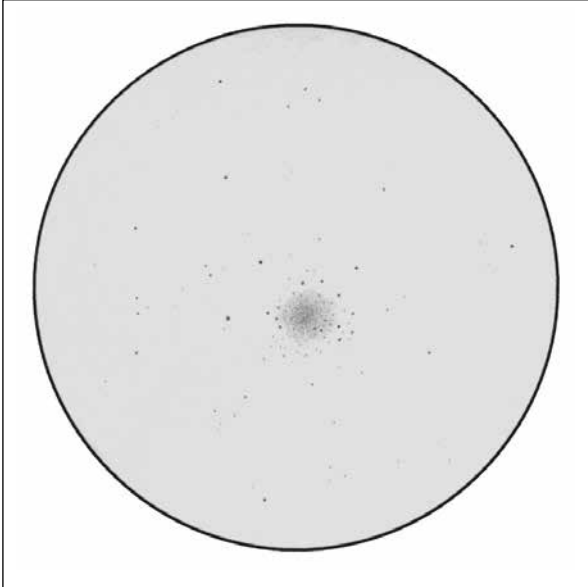
NGC 55 – Photograph: Dieter Willasch

Approximately 2 degrees east from lambda Sculptoris is the open spiral galaxy **NGC 300**, also known as the Southern Pinwheel. The double star lambda Sculptoris form a lovely pair with a white magnitude 6 primary and a magnitude 5.9 yellow-coloured companion. The galaxy however displays a large, faint, round to slightly oval smudge of light in a north-west to south-east direction, growing very gradually brighter towards its relatively small nucleus. Faint stars can be glimpsed embedded on the dusty surface. Auke Slotegraaf saw this galaxy as a small cloud in his 11×80 binoculars, with a magnitude 9.5 star immersed in its north-eastern border.



NGC 300 – Photograph: Dieter Willasch

Close to the eastern edge of the Sculptor constellation and 5 degrees west of the Fornax constellation, Bruno Alessi came across a lovely star grouping **ALESSI J01232-3330**, consisting of eight stars, all slightly yellowish in colour. The brightest is the magnitude 6.7-star HD 8474, which is situated towards the south.



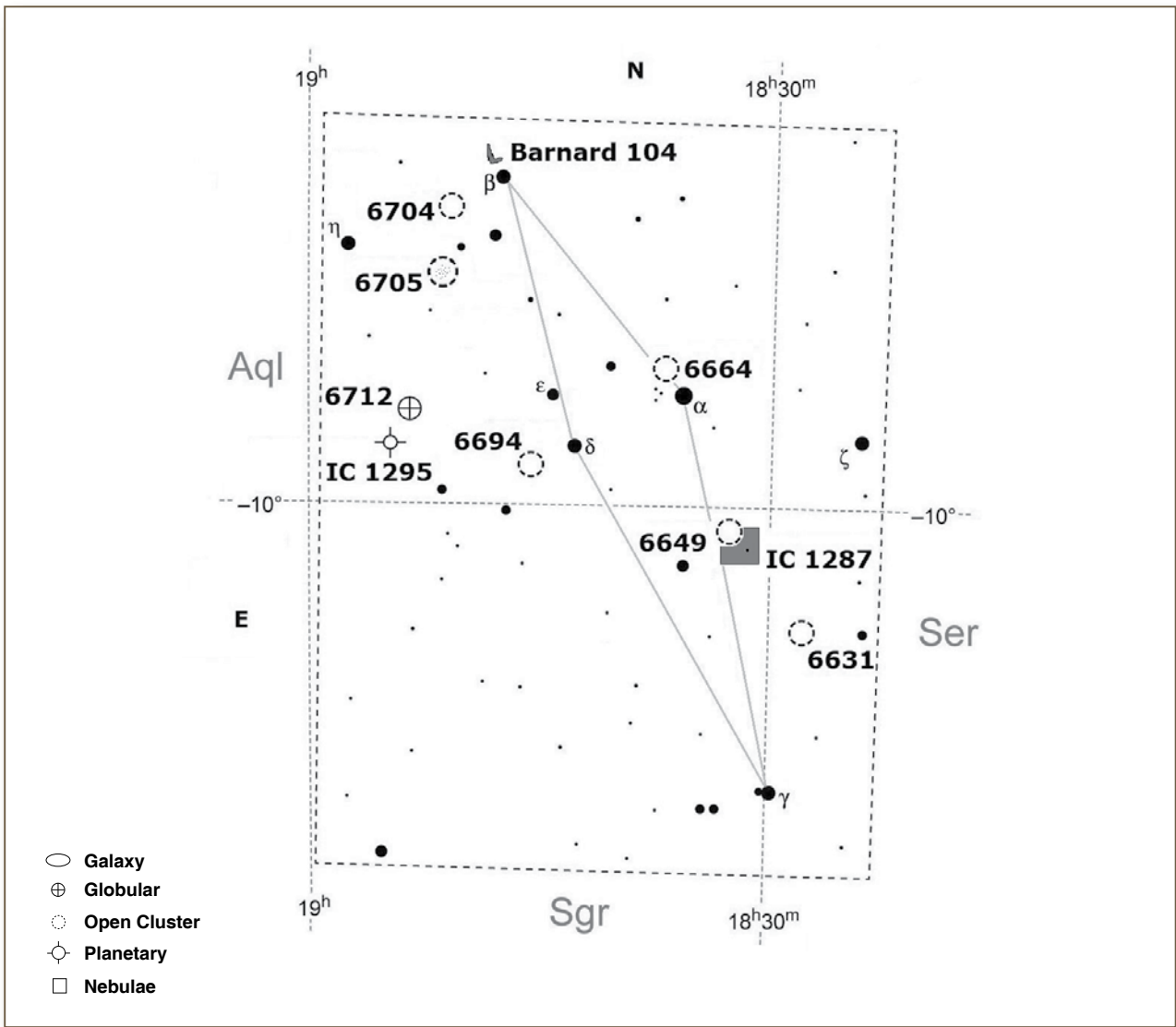
NGC 288 – Globular Cluster

Globular clusters are a favourite and are very popular among observers. **NGC 288** is no exception, displays a soft, hazy glow with faint resolved stars, although it could also have the appearance of a dense, very distant faint open cluster. With higher magnification it appears as a bright ball of glittering lights, splashing out in a haze. The uneven core is not very dense, but it stands out fairly well. Brighter stars dot the outer edge of this globular, which shows off beautifully against the background star-field. This globular is about 300 000 light-years away and looks like a distant comet in small telescopes. Sculptor's claim to

fame is that the southern galactic pole is less than a degree south-west of this lovely object. The well-known edge-on galaxy NGC 253, only 1.5 degrees further north was discovered by Caroline Herschel on 23 September 1783 with her 4.2-inch reflector.

The idea is to linger unhurriedly, just like a skilled Sculptor, among the wonderful objects in this constellation, because it is the time taken during an observation that makes all the difference.

OBJECT	TYPE	RA	DEC	MAG	SIZE
BLANCO 1	Open Cluster	00h04m.3	-29°56'.0	4.5	70'
NGC 55	Galaxy	00h14m.9	-39°11'.0	8.1	30'×6.3'
STREICHER 90	Asterism	00h27m.5	-35°17'.3	11	20'
ESO 350-G40	Galaxy	00h37m.7	-33°43'.0	12-13	1.5'×1'.2'
NGC 288	Globular Cluster	00h52m.8	-26°35'.0	8	13.8'
NGC 300	Galaxy	00h54m.9	-37°41'.0	8.1	20'×13'
PGC 3589 Sculptor System	Dwarf Galaxy	00h59m.6	-33°42'.5	11+	30'
ALESSI J 01232-3330	Asterism	01h23m.2	-33°30'.0	6.7	8'



The constellation of Scutum



Portrait of John Sobieski 1680
(Photograph: Jan Tricius)

SCUTUM

The Protective Shield

If we take the time to look up at the Milky Way, it is such a privilege to be able to revel in the wealth of stellar beauty, and of course our eyes would also be exploring the hub of what forms the center of our galaxy. Constellations like Sagittarius and Scorpius, which take pride of place, sometimes overwhelm the lesser known constellations suspended at the bright fringes of the Milky Way. One such constellation is Scutum, which can truly boast objects of wonder to please the eye.



In composition, Scutum forms a long triangle stretching from beta and alpha in the north to gamma Scuti in the south. Scutum is the fifth smallest amongst the 88 constellations. Johannes Hevelius (1611–1687) named the constellation in 1683 Scutum Sobieski, The Shield, to celebrate King John Sobieski of Poland, who successfully defended his country against the Ottoman Empire.

The open cluster **NGC 6631** is located about 1.2 degrees from the border with Serpens; a loose, stringy V-formation that contains around 20 faint stars in a north-west to south-east direction. Not necessarily bright and outstanding, but worth a visit to open a path to the splendid objects housed by this constellation. A good number of PK planetary nebulae and smaller open clusters can be found in the surrounding star field of NGC 6631. Perek Lubos and Kohoutek Lubos published their catalogue of Galactic Planetary Nebulae which contains 1036 nebulae, in 1967 referred to simply as PK.

Snugly protected by the Scutum shield, is the diffuse nebula **IC 1287**. An obvious glow enfolds the central double star Struve 2325, which can be seen with ease in ideal dark-sky conditions. The double star has a magnitude 5.8 super-white coloured star with a magnitude 9.1 companion, a separation of 12.3" and position angle (PA) of 257°. Filters will bring out the washed-out, delicate nebulosity that extends slightly hazily towards the north-east from the stars. There is some speculation that it could be the trace of a supernova remnant.



Open Cluster NGC 6649 and Nebula IC 1287
Photograph: Dean Jacobsen

The open cluster **NGC 6649** is situated only 40' further towards the north-east and inside the nebula, and displays an outstanding tight bundle of colourful faint stars. The focus of this cluster is the lovely magnitude 9.7 deep red coloured star situated on the southern outskirts of the group. The eastern side of the cluster contains the bulk of the stars. The double star Struve 2325 can be seen towards the middle of the photograph.

Further north the magnitude 3.8 alpha Scuti displays a lovely, rich yellow colour and is positioned only 35' south of the open cluster **NGC 6664**. The cluster is relatively large and outstanding, although the star field is scattered with faint Milky Way stars that mingle well with this group of more or less a dozen stars. Immediately south of the group scattered faint stars can be seen perhaps slightly more outstanding than the cluster itself.



NGC 6712 – Photograph: Dale Liebenberg

Against the Milky Way shield the eastern area of the constellation holds the fine globular cluster **NGC 6712**. This lovely, round, cotton-ball-looking cluster is outstanding, shining and quite prominent against the star field. It displays a slightly brighter center with faintly resolved stars on its surface giving it a frost-coated impression. A more prominent dainty string is obvious towards the outer southern edge, together with a

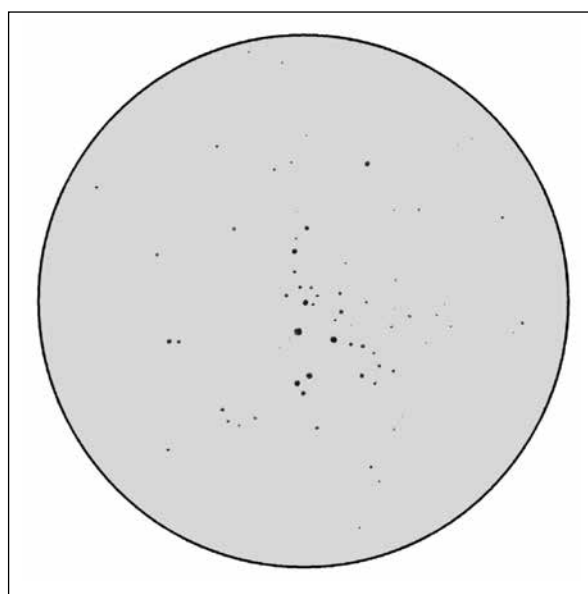
few curly shorter ones. John Herschel recorded it as "a fine object, the stars very close and numerous".

Just 25' south-east of NGC 6712 is the planetary nebula **IC 1295**, which displays a large ghostly glow with a very low surface brightness. It seems to be slightly oval in shape with a magnitude 11 star on its north-western edge. It is advisable to use a planetary filter to be able to glimpse this very faint glow. The object is one of a hundred deep sky objects discovered in the 1860s by Truman Henry Safford at Dearborn Observatory in Chicago. Heber Curtis of Lick Observatory first recognized it as a planetary nebula in 1919.



IC 1295 – Photograph: astrophotos.net

NGC 6694 has its home against the dense backdrop of the Milky Way. This elongated north-south cluster, better known as Messier 26, is impressive and outstanding, sharing the field with numerous faint stars. What impresses me most about this group is the S-shaped string starting towards the middle with a block of stars and then curving out towards the north. The super-white magnitude 9.2 star draws the attention towards the southern edge of the group. The cluster was first discovered by Le Gentil in France sometime before 1764 and is credited to him.



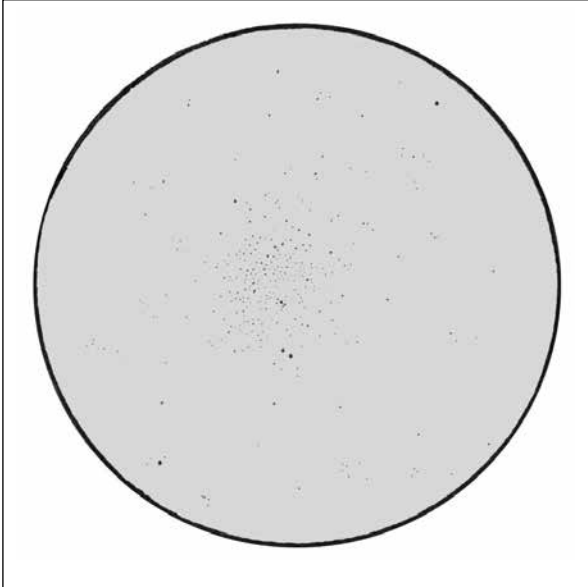
NGC 6694 – Open Cluster

The northern part of the Scutum shield is marked by the magnitude 4.2 buttery yellow beta Scuti. Only a few arc-minutes north of beta Scuti the dark nebula **BARNARD 104** hides between the field stars, seen by many as a hooked V-shape. Shield your eyes from stray lights in order to glimpse this dark void, and make sure the skies are favorably dark and transparent.



BARNARD 104 – Photograph: Flickr

Scutum houses numerous open clusters but most of them are faint and not easy to spot against the backdrop of the dense Milky Way. **NGC 6704** is situated a degree east of beta Scuti and comprises mostly magnitude 12+ stars in a very obvious north-south direction. What makes this cluster special is the prominent dark lane in the eastern part of the group, also running from north to south.



NGC 6705 – M11 – Open Cluster

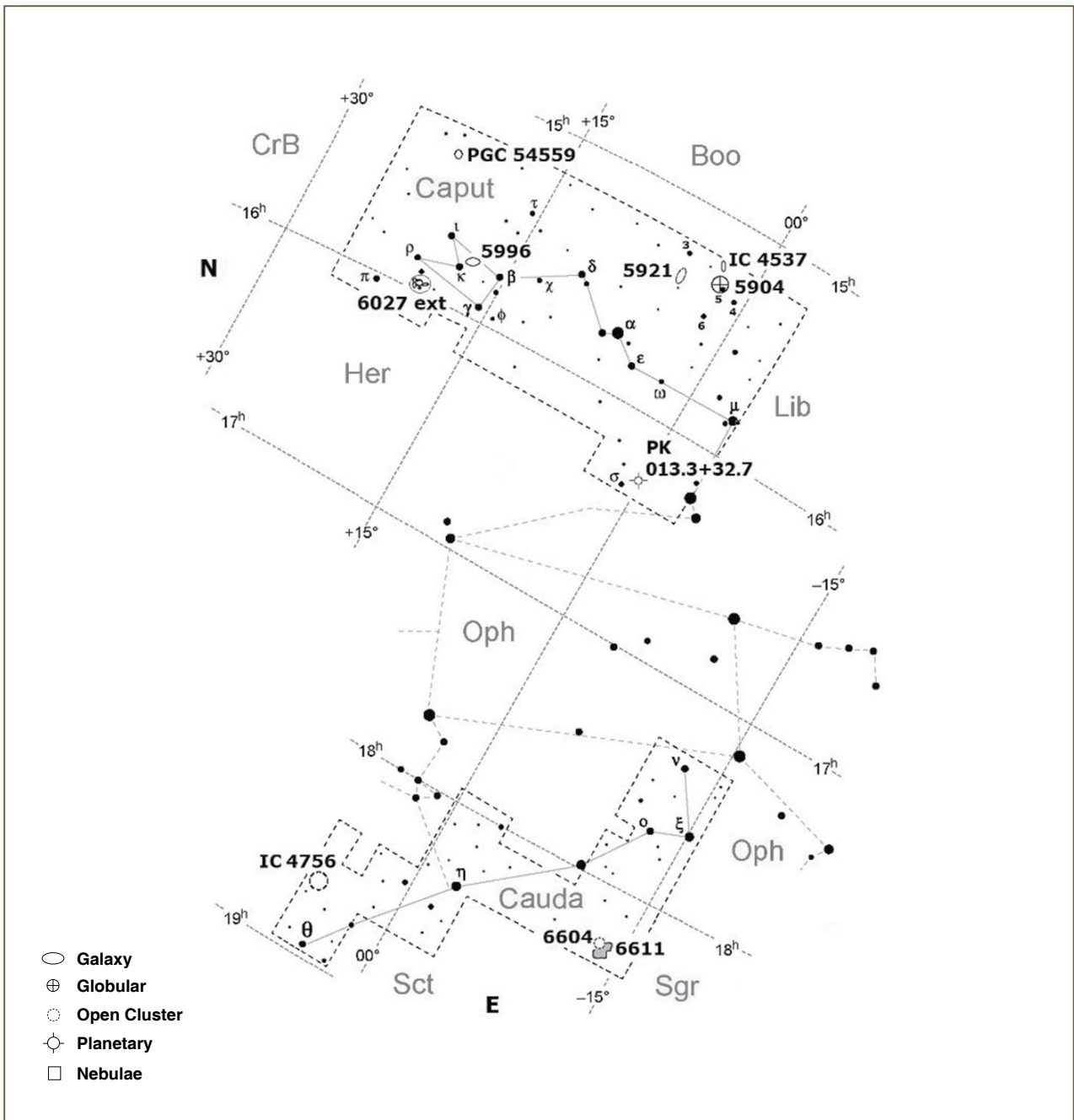
The showpiece object of the constellation, outshining the rest by a long way, is **NGC 6705**, better known as Messier 11. It is without doubt one of the most outstanding examples of an open cluster, with a lot of character, hanging on the Scutum Star Cloud. German astronomer Gottfried Kirsh (1639–1710) discovered this beautiful object in 1681. The cluster was first resolved in a myriad of stars during the middle of the 17th century, after which Charles Messier, the comet hunter, added it to his catalogue as the 11th entry on 30 May 1764. It is believed that the English observer William Henry Smyth (1788–1865) gave this object its

now popular name, the Wild Duck Cluster. It could well be that the name was inspired by the familiar flocks of ducks found in the south of England. The grouping appears as a splendid object through binoculars and can even be observed as a naked-eye fuzzy spot in truly dark skies.

The cluster displays a swarm of bright pinpoint stars, well resolved, running in extended trails with dark spots among them with a more outstanding and larger dark patch west of center. Careful observation brings to the fore a narrow, dark lane running through this flocks of stars. A bright magnitude 8 star, probably not a true member, is embedded in the south-eastern part, with a pair of yellow coloured magnitude 9 stars on the southern rim. The Wild Duck Cluster beautifully reflects its name, with the flock of members following the bright leaders in flight. This amazing cluster is believed to be about 500 million years old, with approximately 1000 stars in its midst.

As humans we are continually trying to shield ourselves against heart sore and danger, but a delight awaits those who care to search out the wonders against the backdrop of the starry Scutum shield.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 6631	Open Cluster	18h27m.2	-12°02'.0	11.7	5'
IC 1287	Nebula	18h31m.6	-10°47'.3	8.5	20'
NGC 6649	Open Cluster	18h33m.5	-10°24'.0	8.9	6'
NGC 6664	Open Cluster	18h36m.7	-08°13'.2	7.8	16'
NGC 6694 Messier 26	Open Cluster	18h45m.2	-09°24'.0	8	15'
BARNARD 104	Dark Nebula	18h47m.3	-04°33'.8	5	16'×1'
NGC 6704	Open Cluster	18h50m.9	-05°12'.1	9.2	6'
NGC 6705 Messier 11	Open Cluster	18h51m.1	-06°16'.0	5.8	14'
NGC 6712	Globular Cluster	18h53m.4	-08°42'.3	8.2	7.3'
IC 1295	Planetary Nebula	18h54m.6	-08°49'.7	14.5	86"



The constellation of Serpens

SERPENS

The Slinky Serpent

Fortunately, the serpent we're dealing with in this article is known as a constellation, because let's face it, most of us are rather more than wary of real, living snakes that share the space on planet earth with us!

The word "serpent" is from French. In Germany the constellation is known as "die Schlange", the very sound of which seems to embody and suggest the meaning of that creepy creature. Serpens is intertwined with the stars of the Ophiuchus constellation, which is why it is in two parts, namely Serpens Caput (the head) and Serpens Clouda (the tail), which makes it somewhat complex.



The north-eastern part of the constellation (the head) is situated south of the constellation Corona Borealis and west of Hercules. The proverbial serpent head of Serpens is easily recognisable, four fairly bright stars that are visible in the far north-eastern part of the image in the form of a cross. The northernmost star is the magnitude 4.7 rho, magnitude 4.5 iota towards the north-west, and gamma with a magnitude of 3.8, which shines with a lovely yellow hue towards the south-east. The super-white magnitude 3.6 beta Serpentis is situated towards the south, and is also a triple star with a magnitude 3.7 and magnitude 9.9, with a separation of 30.6". The third companion is a magnitude 10.7 star with a 201" separation in a position angle (PA) of 210°. The lovely deep orange magnitude 4-star kappa Serpentis indicates the mid-point of the cross bar through the Serpens head.

Serpens Caput is home to a few exceptional objects, most of which are galaxies. Less than a degree west from kappa Serpentis, which is only 74 light-years away, is the galaxy **NGC 5996**, one of the first to be classed as an unknown object. The galaxy displays two prominent distorted spiral arms towards the north and south as seen in deep pictures. The very small galaxy NGC 5994 is situated towards just off the southern tip arm.

Perhaps one of the most fascinating multiple objects to observe is the very close grouping of galaxies **NGC 6027** with its companions, better known as Seyfert's Sextet, situated 1.8 degrees east of rho Serpentis. Édouard Jean-Marie Stephan (1837-1923), was a French astronomer who discovered this group in 1882. Among others, he discovered Stephan's Quintet, also known as Arp 319, another group of five galaxies.



NGC 6027 ext. – Photograph: Wikipedia

Seyfert Sextet (NGC 6027) are bunched together in a mere 1.5' field of view. So now you can imagine the difficulty of pin-pointing all the individual members. A first glimpse of Seyfert's Sextet will show the combined sextet as only a very faint hazy patch, perhaps all that one can see through an ordinary telescope. Take into account, then, that the galaxies in this group lie between magnitude 13.5 and 15. Three combined members of the group may perhaps be responsible for the oval brightness of the hazy patch. NGC 6027, the largest,

is a hazy oval with an irregular nucleus in an east-west direction. It has a thin dust lane running through it, and is the basis of the entire group. The smaller galaxy, NGC 6027B, an elongated smear of light, touches the northern edge. The slightly brighter NGC 6027E situated on the northern-eastern edge has an extension that gives the impression of two separate objects. The most southern extended galaxy, NGC 6027C, is a lovely edge-on pinnacle in a north-south direction.

NGC 6027D, a face-on galaxy on the eastern middle edge of the group is a very small round knot of haze, which is probably a separate galaxy and not part of this group. The further away a galaxy is, the faster it recedes from us and the more its light gets shifted towards longer wavelength. The Seyfert's Sextet cluster of galaxies receded at a speed that implies a distance of approximately 200 million light-years from us, but the member NGC 6027D seems to be aligned by chance, although there is also speculation that it might be a part of the cluster, due to hints of interaction. But do not be too disappointed – you can still just appreciate and admire the Seyfert Sextant galaxies through the eyes of a Hubble picture. If one ponders for a few moments the massive vastness of our own Milky Way, it is almost impossible to imagine the scale of a grouping like Seyfert's Sextet. However, the American astronomer who is best known for his 1943 research paper on high-excitation line emission from the centres of some of these compact spiral galaxies was Carl Keenan Seyfert, who had Seyfert galaxies named after him.

Serpens promises not to disappoint, with strange and much talked about objects which open the door to astrophysics to study and understand the universe in depth. We're talking here in particular about Hoag's Object, also documented as the extremely faint galaxy **PGC 54559** in the far northern part of Serpens Caput. Arthur Hoag discovered this faint galaxy in 1950 and it first appeared to him as a perfect symmetrical planetary nebula, which looks indeed like a small, perfectly round haze. Heaven only knows how he found it, but what a bonus that he



PGS 54559 – Photograph: Wikipedia

did, and now we can see it much more clearly through the eyes of the Hubble telescope. This face-on galaxy displays a lovely round image, with a bright, small nucleus of old yellow stars and an outer ring of gas and young stars. But what is strange is that another, similar, look-a-like very small galaxy can be seen between the nucleus and the outer ring, appearing to be situated inside the darker space – this is a very distant galaxy that we can see in this quite unique spot. I think about this small similar background galaxy as Hoag's junior. But there is a nice S-shape asterism to be seen just 5' towards the west of the famous Hoag's Object. It amazes me time and again that there are so many wonderful objects to be found in space, no two of them the same – and then there's Hoag's Galaxy, which extends even further beyond the boundaries of understanding.

Brian Skiff's comment on this object is that it does not fade out in the infrared Schmidt plate-scan image, and this makes him think that it is a barred spiral, specifically one where the arms wind rather tightly into a pseudo-ring. Quote a V magnitude for the core of 15.8 (without the K-correction) and a B-V for the core of +0.96. Converting this to an ectopic magnitude using $S = V + 0.4(B-V)$ gives a magnitude of 16.2. Unfortunately, these are also among the faintest of objects, and it requires a reasonable large size telescope, also very dark sky conditions to find and observe even only a few of the members, and even then, they are just barely visible.

The Serpent's lithe, slinky body slithers southwards, its path well emphasised by the magnitude 2.6 alpha Serpentis, which stands out beautifully with a slightly yellow colour. Shift your gaze westward close to the western boundary to get a closer view of the barred galaxy **NGC 5921**. The galaxy is known for an outstanding elongated centre bar in a north-west to south-east direction with a faint oval ring that hints at a spiral structure. But be warned: it is not at all easy to see detail through an amateur telescope. A magnitude 12 foreground star on the south-eastern edge of the halo can get one quite excited if you think it could be a supernova. Another star shining at magnitude 10 is situated on the south-eastern outer edge of the galaxy accompanied by a lovely rich star field. NGC 5921 lies about 75 million light-years away from us and is also in the company of the extremely faint galaxy UGC 9830 about 36' towards the south-south-east.

Serpens is known for the beautiful globular cluster **NGC 5904**, better known as Messier 5, which is situated 3 degrees further south of NGC 5921. It is one of the most beautiful and brightest globular clusters and can easily be picked out with binoculars. It is almost 13 billion light-years away and about 130 light-years across. In plain language, it has all the qualities of a true rich globular cluster. It displays a very dense, over-exposed core. Dark patches and lanes as well as short faint strings cover the whole of the surface and flares out like embroidery lace, with a somewhat outstanding string on the northern edge. Star members covered in nebulosity indicate more faint stars. This cluster is pleasing to the eye, rich in stars and lifted out of the star field with utmost flair. The yellow-coloured star 5 Serpentis shines with a magnitude of 5.2 and could be seen as the culprit trying to take centre stage only 15' south-east of M5. It is also a double star with a magnitude 10 companion with a separation of 11" and position angle (PA) of 36°. A few arc-minutes towards the west of M5 is a lone roundish fleck of haze indicating the galaxy **IC 4537**, barely seen, magnitude 14.5 in brightness and visible only with high magnification and pristine dark skies through a large amateur telescope.

Close to the Ophiuchus border in the far south-east of Serpens Caput the magnitude 4.8 sigma Serpentis is situated on the cut-line of these two parts. South of sigma Serpentis the planetary nebula **PK 013.3+32.7** has its home. Charles Shane discovered the object and it is casually now known as Shane I. With a magnitude of 12.8 overall it could be difficult to pick up this pin-prick of light in an area that is home to several bright field stars. An easier way of finding it is to start from the fact that the planetary is sandwiched between two look-a-like relatively bright strings of stars, one to the east and another one to the west. An O-III filter is your best tool to bag this small nebula, but do not expect to see the very faint magnitude 16 central star. The galaxy NGC 6100 can also serve as a pointer 1.4 degrees to the north-west.

Sail along, so to speak, with Serpens, right through the arm of Ophiuchus to the southern part of Ophiuchus, which is probably the best way to find the pointed tail of Serpens Cauda. Without a doubt the north-western part of the Milky Way is saturated with starry splendour and a haziness almost resembling a smoky appearance, but which also beautifully highlights the rich nebulae and star groupings. The double star xi Serpentis shines in a super white colour half a degree north from the border line with Ophiuchus. Point your view east from the star into the Milky Way to find another wonderful object that the scary snake holds in its sleek tail.

NGC 6611, perhaps better known as the Eagle Nebula, is situated on the south-eastern edge of Serpens Cauda and very close to the western border of Scutum. Also known as Messier 16, which is famous for many reasons and does not disappoint, with a selection of wonders in its dusty mist. The nebula needs to be observed with great care and time to lift out the variable pieces of nebulosity that intervene with starlight.



NGC 6611 – M16 – Photograph: Dale Liebenberg

The cloudy oval shows sections of dark and bright parts and together they filter out into the field of view. With higher power the overall nebula is defined in many rich parts. The north-eastern part of the cloud is brighter, cut into smaller sections with dark inlays, whereas the western section is flimsier. However, the group of faint stars embedded in nebulosity towards the northern area is casually known as the Star Queen Cluster, or IC 4703, although most of the member stars are covered in a hazy envelope. As difficult as it may be, try for the little dark finger inlet towards the southern edge of the main concentration close to a double star. It is not at all impossible to glimpse, but expect it to be just vaguely visible with the help of an H-Beta filter and averted vision.

The pillars inside M16 are the effect of radiation pressure and stellar winds from the hot Type-O cluster stars and hot gas that develop into pockets of interstellar dust. To appreciate these dark trunks inside the Eagle Nebula, look no further than the outstanding picture of the Hubble telescope – one of its most famous. There is speculation that this rich hazy part situated in the Sagittarius/Carina arm section could also belong to the same line of nebulosity as Messier 17, known as the Swan Nebula.



NGC 6604 – Photograph: DSS

The open cluster **NGC 6604** is situated 1.5 degrees further north of NGC 6611 indicating a rich group of starlight. It's a small cluster of stars, but very refreshing in shape. In a way, the stars of varied magnitude look like a miniature Corona Borealis open towards the north. This cluster is about the same distance from us as M16, but slightly obscured from the known dark rift in the Milky Way.

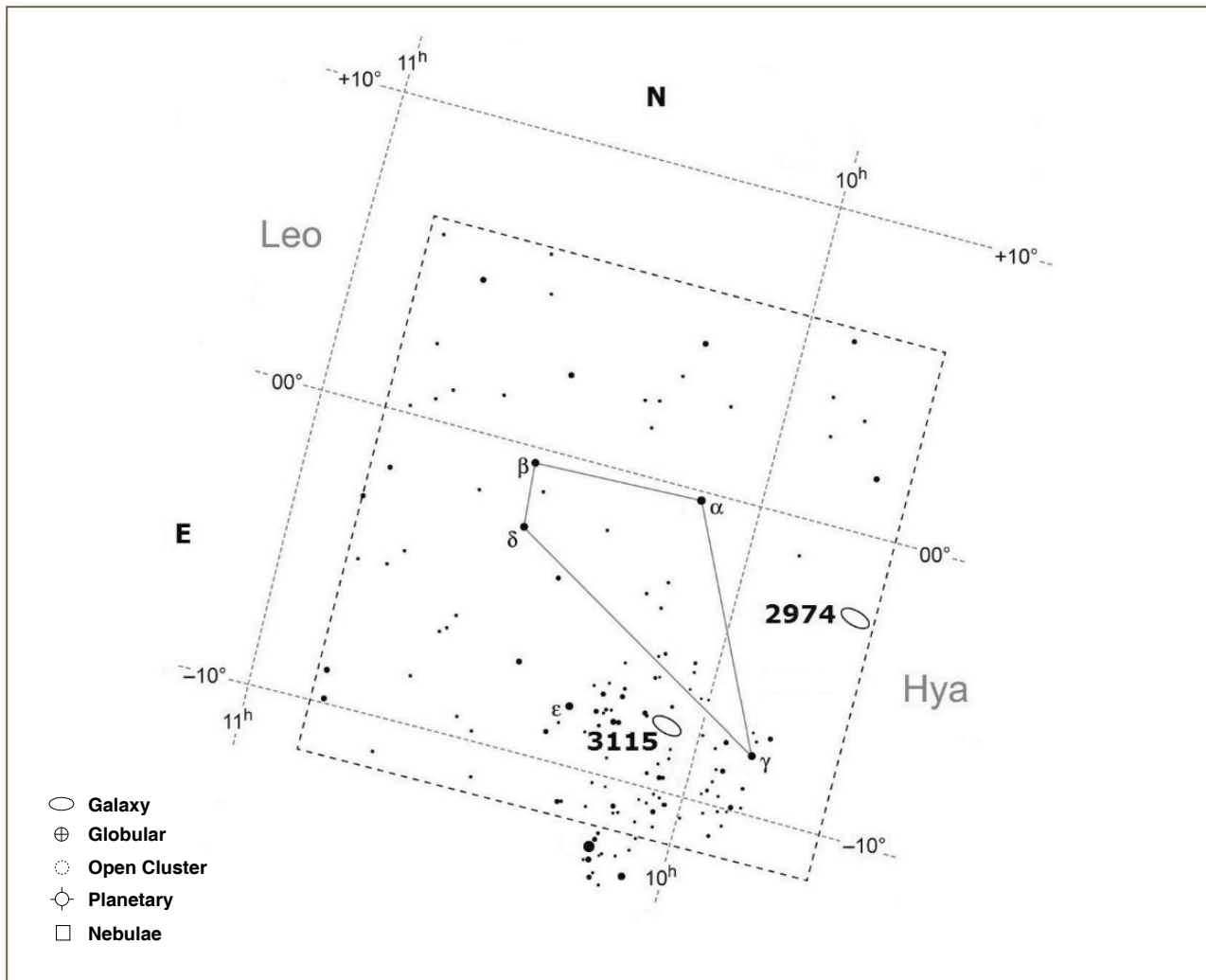


IC 4756 – Photograph: Wikipedia

At the very end of the starry serpent's tail is the magnitude 4.5 and magnitude 4.9 double star theta Serpentis, situated close to the border line with the constellation Aquila. The open cluster **IC 4756**, which is just a degree south is situated in a very rich star field. It is a bright and large cluster close to a degree in size, easily seen through binoculars. The various magnitude members are spaced with faint stardust in between. The beauty of this sunshine cluster is in the different star colours, shining like crystals to appreciate through the eye of the beholder.

Serpens the constellation, so as not to be too scary, shows us its two faces in surprisingly different ways which are not expected but well appreciated.

OBJECT	TYPE	RA	DEC	MAG	SIZE
PGC 54559	Galaxy	15h17m.2	+21°35'.7	16	1'×0.9'
IC 4537	Galaxy	15h17m.3	+02°02'.8	15	0.3'×0.2'
NGC 5904 Messier 5	Globular Cluster	15h18m.6	+02°04'.8	5.7	17.4'
NGC 5921	Galaxy	15h21m.8	+05°04'.2	10.8	4.8'×4.2'
NGC 5996	Galaxy	15h46m.8	+17°52'.2	12.8	1.8'×1'
NGC 6027 B/C/D/E	Galaxies	15h59m.2	+20°45'.2	14.3	Combine 1.5'
PK 013.3+32.7	Planetary Nebula	16h21m.3	-00°16'.3	12.8	6"
NGC 6604	Open Cluster	18h18m.3	-12°14'.6	6.5	4'
NGC 6611 Messier 16	Nebula	18h18m.8	-13°47'.7	6	18'
IC 4756	Open Cluster	18h39m.3	+05°27'.2	4.6	38'



The constellation of Sextans



The Sextans of 1673, on display on the roof of the old observatory in Beijing
 Photograph: Mike Read

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2974	Galaxy	09h42m.6	-03°41'.9	10.9	3'×1.7'
NGC 3115	Galaxy	10h05m.2	-07°43'.0	8.9	8'×2.8'

SEXTANS

A Stellar Instrument

Sextans Uraniae was formed by Hevelius to commemorate the Sextant, so successfully used by him in stellar measurements during the 1600s. The original shape of the constellation comprised the twelve unclaimed stars between the constellations Leo and Hydra.



The galaxy **NGC 2974** is situated virtually on the western border with Hydra. The stars in the field play an important role when complementing this relatively bright oval shaped galaxy. It is difficult to detect the faint nucleus, but a slight brightening towards the centre is suspected.

In the southern part of the constellation the galaxy **NGC 3115** is to be found, also called the Spindle Galaxy. Known as a lenticular S0-type galaxy it nestles in a lovely star rich field of view. The very much extended oval stretches in a north-east to south-west direction, with the galaxy's tips running out thinly and fading away into the field of view. The bright nucleus, slightly tilted resembles a flattened lens in a way. The object was discovered by William Herschel in 1787. At about 32 million light-years away from earth, it is several times bigger than the Milky Way.

Mike Read wrote a short summary of the observatory in ancient Beijing: "The observatory was founded in 1442, and operated continuously until 1929 for almost 500 years. The Dutchman Johann Adam Schall von Bell advised the Chinese to adopt the Western standard numbering and measuring systems. In 1673, the Chinese Emperor invited Ferdinand Verbiest to build a new set of instruments and these are now preserved on the roof top of the building. The Azimuth Theodolite was built by Kilian Stumpf in 1715 and a new Armilla in 1744. In 1900, during the Boxer Rebellion, the German and French Invaders stole the instruments for their museum, but they were returned to China at the end of the 1914-1918 war."



The Azimuth Theodolite was built by Kilian Stumpf in 1715 and a new Armilla in 1744. In 1900, during the Boxer Rebellion, the German and French Invaders stole the instruments for their museum, but they were returned to China at the end of the 1914-1918 war."

A group of ASSA members visited the country of China for the July 2009 solar eclipse. It was one of the longest in duration which totality was due last nearly seven minutes. Rain dominated eclipse day unabatedly, as the bus laboriously made its way southwards, where we hoped to find better conditions, but sadly in vain.



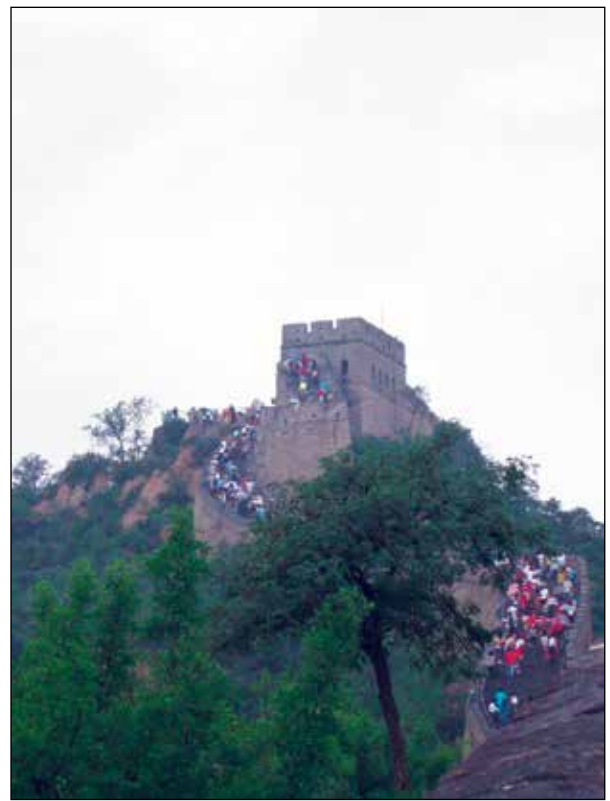
With the time for the eclipse approaching and just minutes to go, before total darkness set in, the dark grey clouds wrecked our last hopes of seeing anything of the sun, totality completely blocked out for us somewhat strange sun-seekers.



It was disappointing, my only picture, a glimmer of the nearly covered sun as seen through the thick cloud-cover and pouring rain.



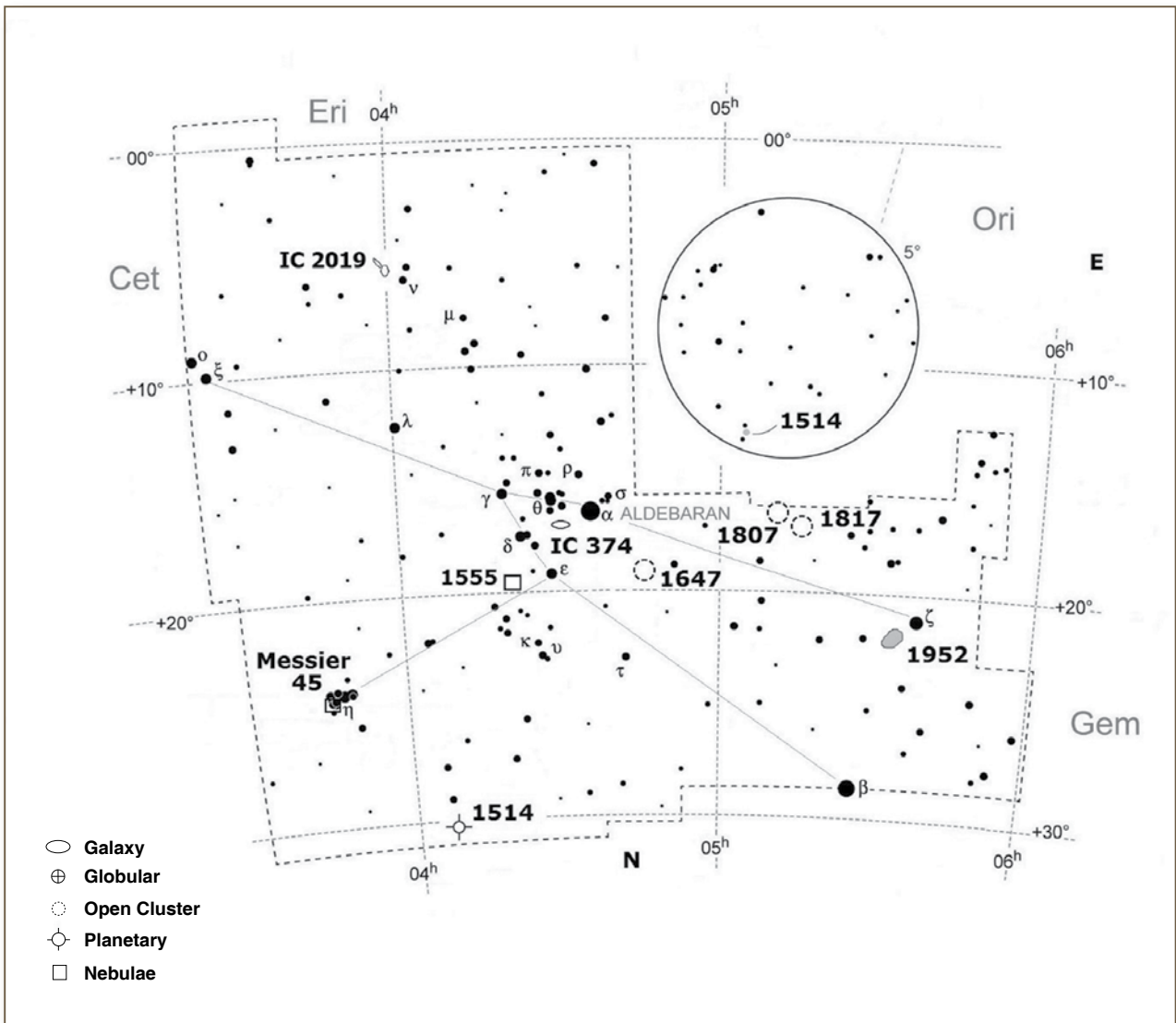
China is a country of contrasts and many facets. The welcome was insightful, and there were cars, bicycles and masses of people everywhere, surprisingly orderly, with a history stretching a long way back. The Great Wall astounds, and takes one's breath away; and then there are the ruler clay soldiers, the eighth wonder of the world according to a rather cute Chinese tour-guide girl.



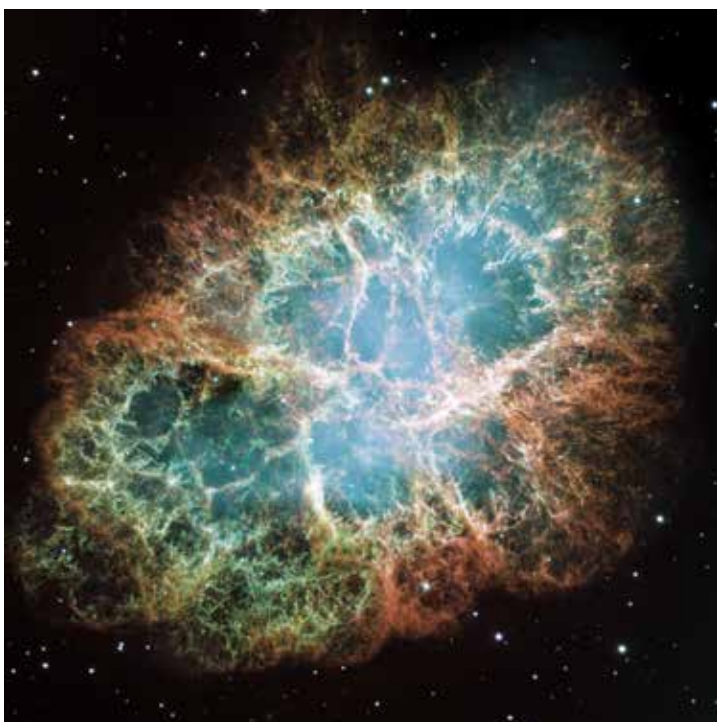
The well-known Terra-cotta warriors were found in the Shaanxi province at the original mausoleum of QinShihuang, the first emperor in Chinese history. These amazing pottery statues, bronze chariots and horses will linger in my mind forever.

Myself, Margie, Pat and Johan





The constellation of Taurus



NGC 1952 – M1
 Photograph: Wikipedia

TAURUS

The Taurus Giants

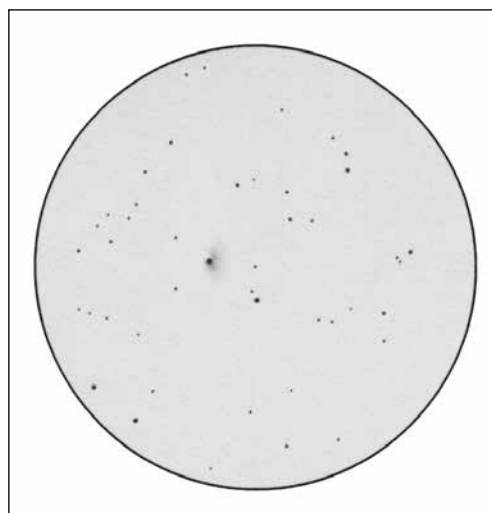
The constellation Taurus, the celestial Bull, is one of the oldest to have been designated and is easily recognisable against the northern night sky during the southern hemisphere summer. The Germans call this constellation Stier. It has also been called "rich in maidens", referring to the Hyades and Pleiades clusters. What is clear is that there is an overwhelming number of gigantic and exceptional deep-sky objects in this constellation.



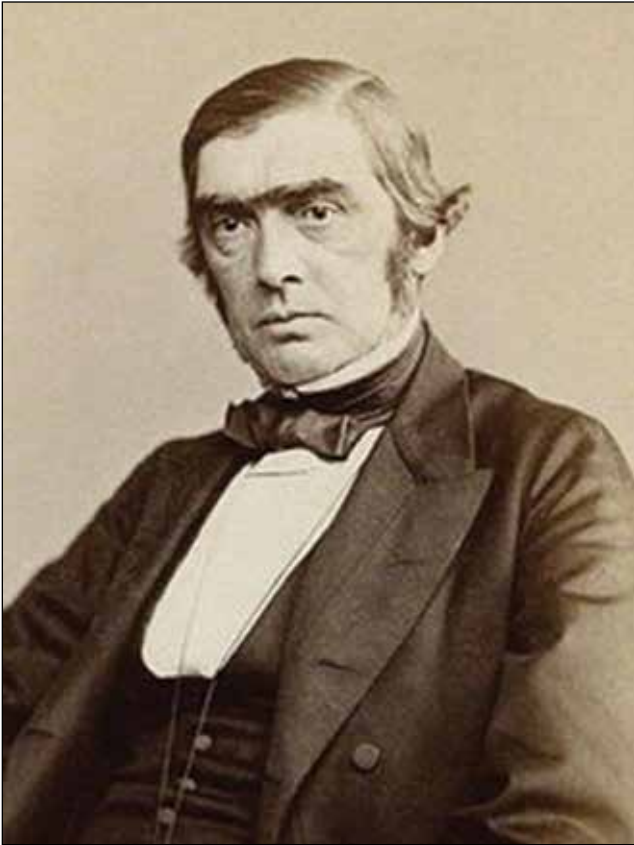
The magnitude 1 alpha Tauri conveniently indicates the Bull's red, fiery eye, sometimes referred to as the rival of Mars due to its red-orange colour. The name Aldebaran comes from Al Babaran, the "Follower" of the Pleiades, the best-known open cluster in the night sky. Although Aldebaran appears in the Hyades star cluster, it is actually a foreground star, 68 light-years distant. The naked-eye Hyades group represents the Bull's head and is about 150 light-years away from us.

The galaxy **IC 374**, not actually classified as one of this constellation's giants, is situated 50' west from alpha Tauri (Aldebaran), but is something of a challenge to spot as its weak glow competes against the glare of the beautiful star. It is a faint object which becomes slightly brighter towards the middle. While it is faint, it is however quite something for this galaxy to have such a famous and wonderful star as its neighbour.

The western eye of the Bull is represented by magnitude 3.5 epsilon Tauri. Continue 1.5 degrees east to locate one of the most famous stars T Tauri and a reflection emission nebula. Variable stars are not uncommon, but here we have one accompanied by a very special object. **NGC 1555**, the variable nebula makes the combination outstanding. The object was also given a separate catalogue number NGC 1554 by Otto Struve in 1868, but has lately been classified as only a close pair of stars 4' to the south-west of T Tauri.

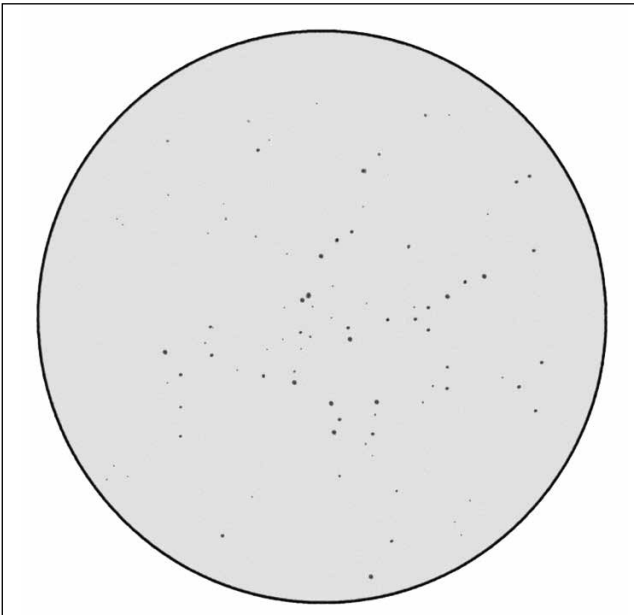


NGC 1555 – Variable Nebula



Russell Hind – Photograph: Wikipedia

Russell Hind, who discovered the phenomenon, was an English astronomer employed at the George Bishop's Observatory. On 11 October 1852, during a routine observation, he saw a glow, close to a magnitude 9.8 star in the northern part of the Taurus constellation. It was, in fact, a variable star and variable nebula, now known as Hind's Variable Nebula, or NGC 1555, possibly in the region of 5 million years old. Starlight illuminates the gas and dust surrounding the nebula, which varies between magnitudes 9 to 13.5. Discovered in 1852, it faded from view in 1868 and did not reappear until 1890.

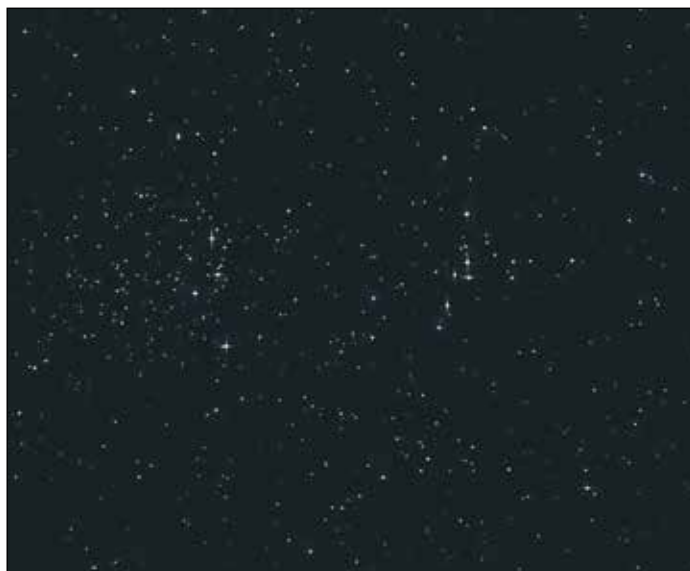


NGC 1647 – Open Cluster

The open cluster **NGC 1647** is situated 3.5 degrees north-east from the star Aldebaran. This beautiful cluster is a star grouping with a difference. Also called the Crab Cluster (not to be confused with the Crab Nebula), it displays a loose and widely spaced grouping with long strings of stars with a few pairs in their midst. A collection of approximately 50 stars with various magnitudes. Auke Slotegraaf says the two curving rows of stars towards the west and north-west suggest the pincers of the starry crab. Four shorter outliers mark the tips of the legs and the clump of stars

in the middle form its body. NGC 1647 was the first object discovered by William Herschel on 15 February 1784 while testing a new speculum-metal mirror for his 18-inch telescope.

Approximately 6.5 degrees south-east the twin clusters **NGC 1817** and **NGC 1807** are situated in a field of view with a radius of a mere 30'. The brighter of the two is the western group NGC 1807, which is home to about 30 stars that appear magnificent in composition. The galaxy, PGC 16865 is situated within the southern boundary of NGC 1807. I would certainly not try searching for this extremely faint galaxy, or recommend it as it requires extreme dedication. NGC 1817, situated only 25' north-east of NGC 1807, appears much fainter, but larger and more concentrated. An uneven chain of stars runs through NGC 1817 from north to south.



NGC 1817 and NGC 1807
Photograph: Lucas Ferreira

Most people have admired and marvelled at the outstanding, bright, naked-eye star cluster commonly known as the Seven Sisters, which adorns the night sky at a certain time of the year. Lately, only six members can be seen with the naked eye, due to the slight fading from view of one of the sisters named Celaeno.

Of course, this relatively young star cluster, named the **PLEIADES**, or Messier 45, is home to many more stars which cannot easily be seen with the naked eye, as first noted by Galileo in his 1610 book *Sidereus Nuncius*. The fact that it



PLEIADES– Photograph: Adam Block

is enveloped in a soft haze has given rise to a general belief that the haze was partly responsible for the development of this young cluster. However, the group is moving through the gas nebula and the two are not at all related. The soft glow enfolding the Pleiades was discovered by Edward Emerson Barnard in 1893. The Pleiades is about 400 light-years away, so in 2010 we saw the starlight of the group around the time Galileo was mapping them with his telescope.

The Pleiades also offers Barnard's Merope Nebula, or IC 349, discovered by him in 1890 and should not be confused with the cloud of well-known nebulosity around the star 23 Tauri, called the Merope Nebula or NGC 1435. IC 349 is a small, brighter patch within the Merope Nebula. It is only 30" in diameter and situated very close to the star Merope's south-eastern edge. There is also the Maia Nebula, NGC 1432 in the northern part of the cluster which surrounds the star Maia, one of the other sister stars. Search out these faint tendrils in the Pleiades – it is quite a journey.



NGC 1514 – Photograph: CloudyNights

On the northern edge of the Taurus constellation, catch a glimpse of one of Taurus's hidden jewels. The planetary nebula **NGC 1514** is a favourite of many, and is also known as the Crystal Ball Nebula. The overwhelming centre star, magnitude 9.5, dominates the surrounding nebulosity, but the nebula itself shows up as a halo with faint wisps when viewed through an oxygen (O-III) filter. The north-eastern and south-western edges of the nebula are slightly fainter, which gives it something of a dumb-

bell shape. A challenge is to spot the magnitude 13 star just off the northern edge of the nebula. This is Herschel's famous "star with an atmosphere", found by him in 1790. It was the key object for his theory that true nebulosity exists to form new stars.



IC 2019 – Photograph: In-The-Sky

While the Taurus constellation does not contain any bright galaxies, all can be forgiven because there is no shortage of magnificent objects within its boundaries. A pair of interacting galaxies **IC 2019** is situated only a half a degree south-west from nu Tauri. The north-eastern spiral displays a slight elongated shape with the smaller galaxy touching the south-western tip. It is a special pair of galaxies, but so faint it is difficult to observe through amateur telescopes.

On the morning of 4 July 1054, Chinese observers sighted a new star close to magnitude 3 zeta Tauri, the Bull's southern-most horn, which remained visible until early in the year 1056. The star, which formed in the wake of a supernova explosion, could be seen during the daytime for almost 20 days, even rivalling the planet Venus at the time.

The comet hunter Charles Messier happened to stumble upon a nebula in Taurus on the evening of 12 September 1758. The object known as **NGC 1952** became Messier 1 in his famous catalogue of nebulous objects, a place of honour well deserved. The nova was discovered in 1731 by John Bevis. The diffuse glow appears as a large north-west to south-east cloud which stands out quite well against a busy star field. Higher magnification through a telescope reveals an uneven



NGC 1952 – Photograph: Lucas Ferreira

edge with irregular patches on an otherwise fairly even surface. At magnitude 9, the now known Crab Nebula, is probably too faint to see with binoculars, but is clearly visible through medium-size telescopes. The nebula is about 6500 light-years distant and 11 light-years across. It is identified as a radio source in 1963 and in X-ray wavelengths during 1964. In 1968 (although this was already clear to Edwin Hubble in 1928) it was confirmed to be one of the Milky Way's supernova remnants, containing a spinning pulsar more or less the mass of the Sun but only 10 kilometre in diameter.

On a few nights in January 2003, mother nature positioned the planet Saturn close to the spot where this exploded star appeared in the year 1054. I can clearly recall glancing towards the constellation Taurus, pretending that Saturn was the naked-eye supernova. Through my 16-inch telescope on the night of 3 January 2003, the contrasting, well-defined planet and nebula Messier 1 glowed in the same field of view. It will always remain one of my precious observing memories.

On 13 March 1781, while working his way through the constellation Taurus, William Herschel noticed an object that did not look like a star. He increased magnification and found that the size of the object also increased, unlike in the case of a star which remains a point of light under high magnification. Though the object stood in Taurus, his reference star was I Geminorum, 3.9 degrees east.



Planet Uranus presented a nearly featureless disk to Voyager II – Photograph: Wikipedia

During a sweep Herschel suspected he had discovered a comet in the eastern part of the constellation, not far from the Crab Nebula. However, it turned out not to be a comet at all, but in fact the planet Uranus. It had actually been noticed for the first time on 23 December 1690 by John Flamsteed, who catalogued it as the star 34 Tauri, more than 90 years before Herschel's discovery! Flamsteed was a beloved astronomer at the Greenwich Observatory, where he compiled the positions of more than 3000 stars published posthumously by his wife Margaret in 1725.

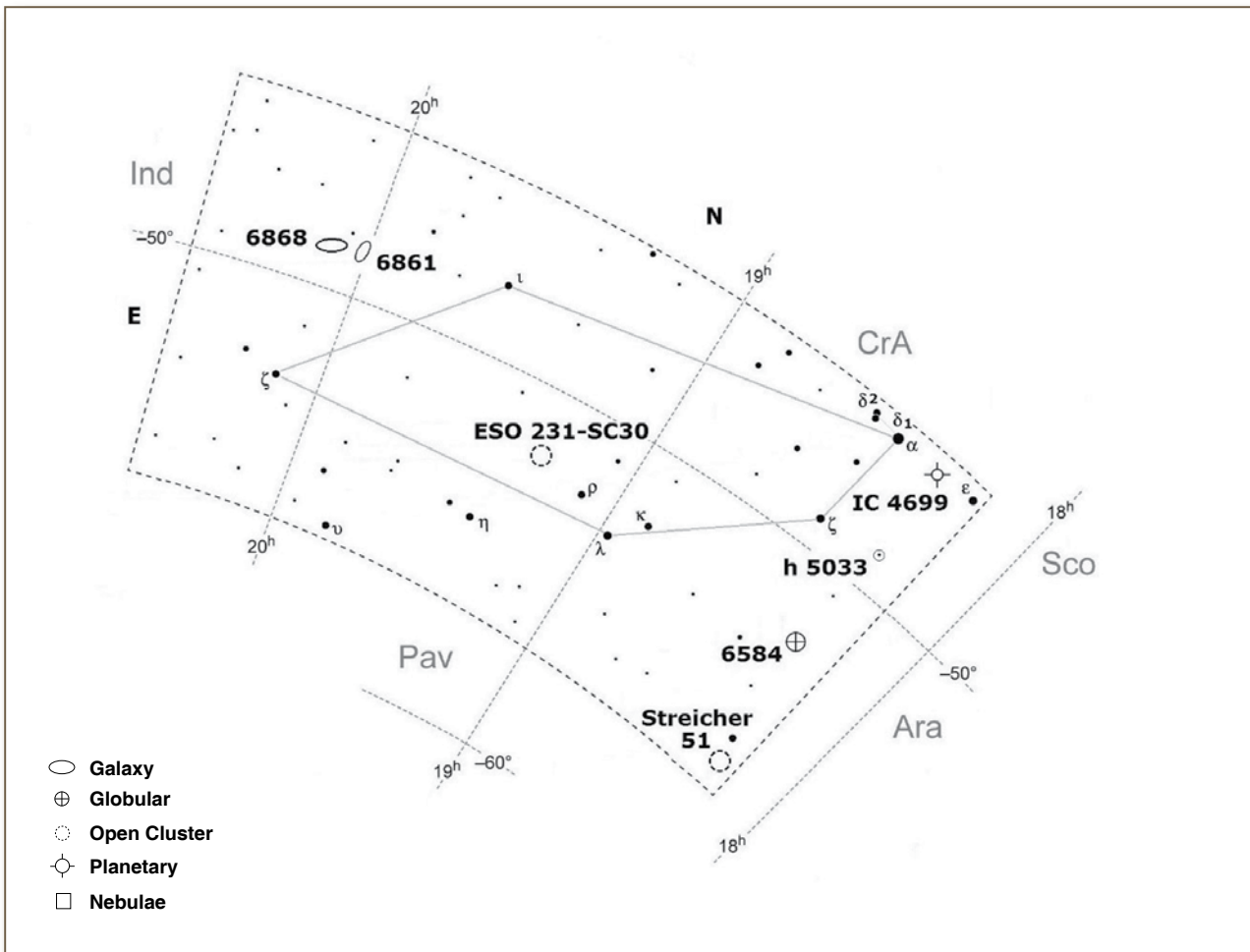


Taurus is indeed a constellation liberally strewn with large, well-known and outstanding deep-sky objects. With this in mind, the word large in whatever dimension struck me once again during one of my visits to the Kruger National Game Park. Respect is commanded when earth's largest land animal, the elephant, suddenly appears right in front of you, as if from

nowhere, on the road you have to travel on! I could just stare in amusement and fascination at this unique and massive animal.

I recall sitting at the campfire that evening, the sun setting over the bush with a red heavenly glow and stretching out its hand, as it were, towards the stars to swear loyalty and respect for great giants.

OBJECT	TYPE	RA	DEC	MAG	SIZE
PLEIADES Messier 45	Open Cluster	03h47m.5	+24°07'.3	1.5	110'
IC 2019	Galaxies	04h01m.7	+05°38'.3	14-15	1'×0.8'
NGC 1514	Planetary Nebula	04h09m.2	+30°46'.5	10.9	114"
NGC 1555	Reflection Nebula	04h21m.8	+19°32'.1	9-13.5	30"
IC 374	Galaxy	04h32m.5	+16°38'.1	12.7	0.8'×0.4'
NGC 1647	Open Cluster	04h46m.0	+19°04'.7	6.4	45'
NGC 1807	Open Cluster	05h10m.7	+16°31'.3	7	14'
NGC 1817	Open Cluster	05h12m.1	+16°41'.3	7.7	17'
NGC 1952 Messier 1	Supernova Remnant	05h34m.5	+22°00'.1	8.4	6'×4'



The constellation of Telescopium



An antique Schiefspiegler Telescope belonging to Mary FitzGerald. During the mid-1960s Miss Dolly Robinson started the construction of these telescope.

TELESCOPIUM

A Spy Glass Telescope

Robert Frost once wrote a poem to say that he would burn his house down for the fire insurance and spend the proceeds on a telescope to satisfy a lifelong curiosity about our place among the infinities. (Credit to an article written by Charles Laird Calia).



Would we ever – even in our wildest dreams – have been able to imagine the universe as we know it today if we had not had any telescopes? We owe the telescope the most honorary position in relation to the stars, because without doubt it is this faithful instrument that reveals so much of the truth to us.

It was with great joy that we celebrated 2009, the International Year of Astronomy and the 400th anniversary of Galileo Galilei's earliest telescopic light rays into the starry night sky. Galileo may have been the first person to realize that the light had travelled for thousands of years to reach our eyes. Try and put his thoughts into perspective, the amazement, the fear and the wonder of it all. Galileo found that Venus goes through a cycle of phases, like the moon, which can happen only if Venus is circling the sun and not the earth. This discovery changed the perception of earth's being the centre of the universe forever.

The German scientist Hermann Oberth (photo) first proposed a space observatory in 1923, followed by American physicist Lyman Spitzer (1914–1997), who suggested such a telescope in 1946. Today we are blessed to have telescopes of different kinds in space, opening the universe to us and providing astronomers with valuable information. The space shuttle Discovery finally carried the Hubble Space Telescope into space on 24 April 1990. This unique telescope, named after Edwin Powell Hubble, has shown that spiral nebulae lie much further away than previously thought, revealing them to be galaxies like our own Milky Way. But you do not need a space telescope to explore the beauty of the night skies; just an ordinary pair of binoculars or a small telescope will bring to your eyes a wealth of deep sky objects that lie on your path.



The constellation Telescopium was named by de Lacaille during his stay at the Cape of Good Hope. It was much larger as stars of neighbouring constellations were included, but is now a mere shadow of its former self. The constellation is situated between Indus to the east, Ara to the west and Pavo to the south. The telescope outline points to the north-west with the lovely reddish glow of magnitude 4.1 zeta Telescopii as the base of the starry telescope.

Discover a medium-sized galaxy group about 120 million light-years distant in the far north-eastern part of the constellation by drawing an imaginary triangle with iota and xi Telescopii. The group consists of no fewer than twelve NGC-numbered galaxies, spanning a 3-degree field of view. The brightest member in this grouping is the giant **NGC 6868**, situated close to the eastern edge of the group. John Herschel discovered this globe of light in 1834. NGC 6868 is a relatively bright oval, growing gradually brighter towards its nucleus.



NGC 6861 – Photograph: Wikipedia

About 25' towards the west, the elliptical galaxy **NGC 6861** occupies the middle spot of this galaxy group. It displays a north-west to south-east oval haze with a bright, prominent small nucleus, which seems slightly off-centred. This impression is given because it could be that the galaxy is slightly brighter towards the eastern part.

The Chandra X-ray observations of the hot gas in and around NGC 6868 and NGC 6861 probe the interaction history between these two galaxies. Mean surface brightness suggests that they are each the dominant galaxy in a galaxy subgroup that is about to merge. Surface brightness and temperature maps of the brightest group galaxy NGC 6868 show a cold front edge to the north, and a spiral-shaped tail to the south.

Towards the middle area of the constellation, north-east of the yellow magnitude 5.1 rho Telescopii, the open cluster **ESO 231-SC30** displays a faint, definite triangular-shaped grouping pointing sharply south. Although faint, it consists of a handful of stars, relatively prominent against the star field. The brightest member, HD 180021, a reddish coloured magnitude 7.9 star, is situated on the eastern side of the grouping with several members spraying out into the northern extremity.

It is not unusual, when in the bush at night, to share the space around your telescope with the ever-present night creatures. Searching for asterisms, I could hardly believe my eyes when I stumbled across a small miracle in the far south-western corner of the constellation. **STREICHER 51** consists of fifteen stars resembling a praying mantis looking back at me with a pair of white stars situated on the north-eastern side of the asterism. The brightest star HD 165987, the northern "eye", so to speak. The group is situated 10' south of the galaxy IC 4679.

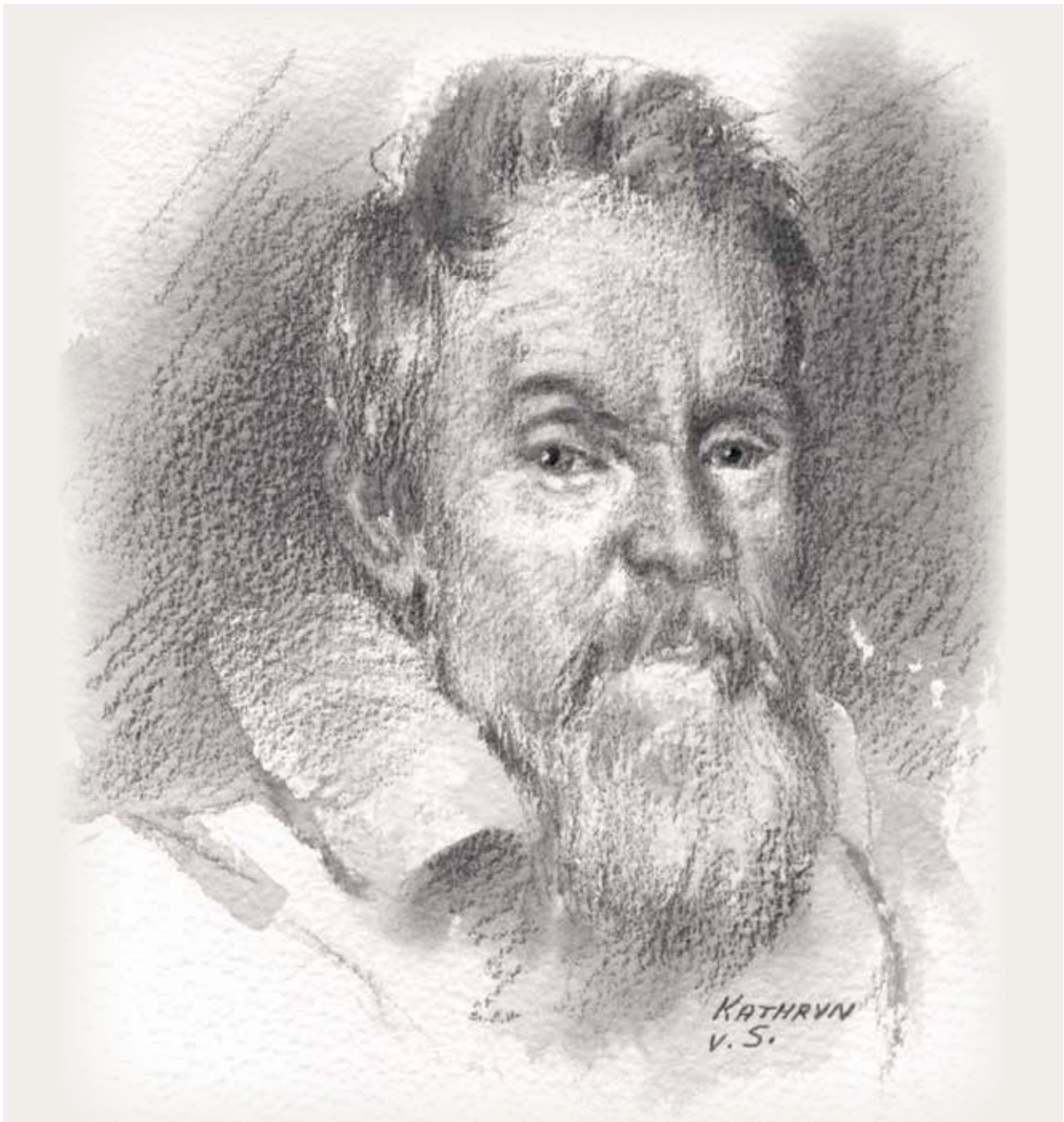
The globular cluster **NGC 6584**, also known as Bennett 107, is situated in the far western part of the constellation. This object could be thought of as an eyepiece lying to the side, if an imaginative mind like mine were to put it into perspective. NGC 6584 shows up as a lovely round bright haze, which stands out quite well against the star field. Higher magnification reveals faint stars becoming hazier towards the unresolved core, which seems to be somewhat out of shape. Three magnitude 10 stars can be seen enhancing the soft outer western part of NGC 6584. Careful observation reveals the southern star as double. The north-eastern side of the globular brings to the fore faint pinpoint stars spraying out into the field of view, whereas the southern part contains fewer stars. The globular is about 45 000 light-years distant.



NGC 6584 – Photograph: Wikimedia

About 3.5 degrees further north, the multiple star h 5033 shows off its pack of four members. The deep yellow primary star occupies the south-western corner of the square formation with a slightly darker yellow companion in position angle (PA) of 115° . The much fainter C companion, appearing grey in colour is in a position angle (PA) of 10° . To complete this multiple system, the D companion is in a position angle (PA) of 46° .

The planetary nebula **IC 4699** is situated between alpha and epsilon Telescopii, barely 30' from the Corona Australis border. Discovered by Williamina Fleming in 1901 on an objective prism plate, the planetary nebula shows up as a tiny grey disc which responds well to an oxygen (O-III) filter. The outstanding delta Telescopii, situated 50' east of alpha, proudly keeps our telescope viewfinder focused on the stars and the universe beyond.



Galileo Galilei – Pencil Sketch: Kathryn van Schalkwyk

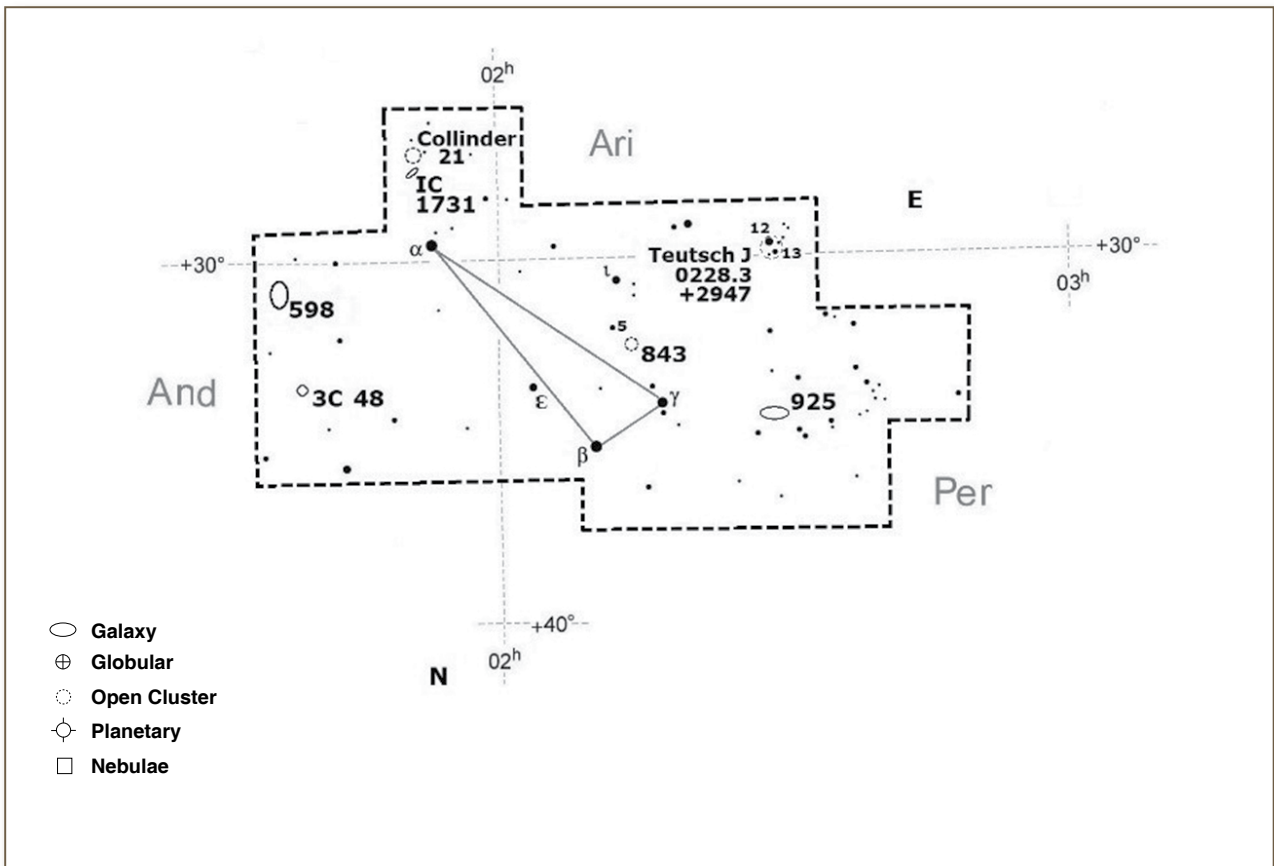
Galileo Galilei was born in Pisa Italy on 15 February 1564 (the same year as William Shakespeare) and died in January 1642. He invented the telescope and used it to make the most striking discovery concerning the four large satellite-moons circling around the planet Jupiter. His famous publication, the *Sidereus Nuncius* (or *Sidereal Messenger*) was published in March 1610.

Let us point our eyes at the starry telescope and explore the depths of its delights which are presented freely to us earthlings.

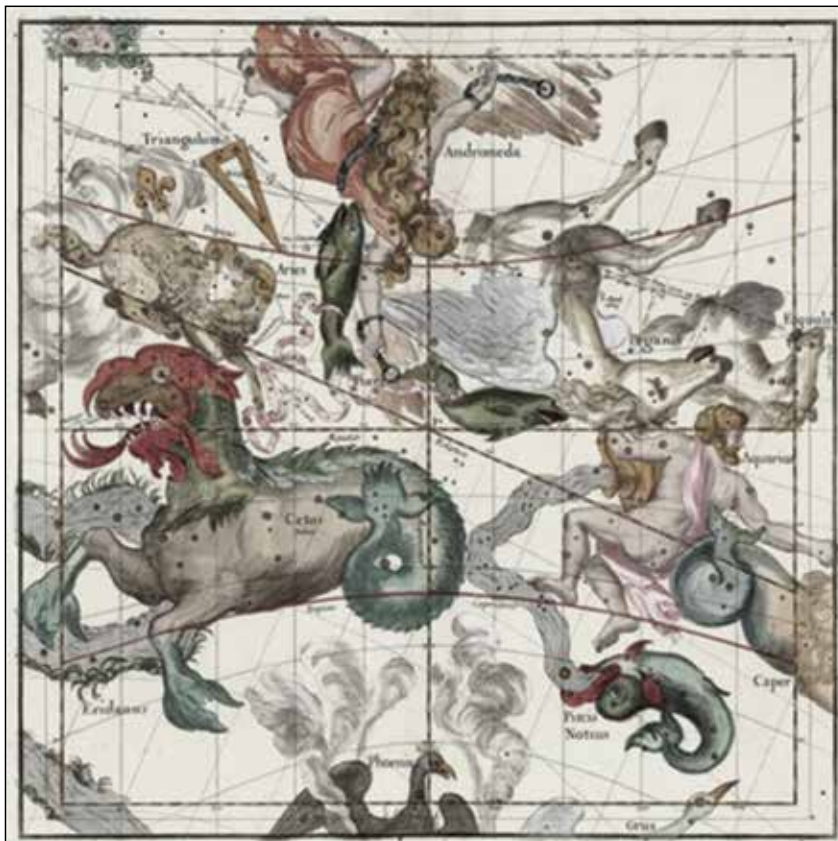
OBJECT	TYPE	RA	DEC	MAG	SIZE
STREICHER 51 DSHJ 1810.4-5629	Asterism	18h10m.4	-56°29'.7	8.5	28'×13'
IC 4699	Planetary Nebula	18h18m.5	-45°59'.0	13	14"
NGC 6584	Globular Cluster	18h18m.6	-52°12'.9	7.9	6.6'
ESO 231-SC30	Open Cluster	19h16m.9	-51°29'.5	11.5	20'
NGC 6861	Galaxy	20h07m.3	-48°21'.8	11.5	2.3'×1.9'
NGC 6868	Galaxy	20h09m.9	-48°33'.0	10.6	3.5'×2.8'



Galileo's telescope and compass
Photograph: Belinda Streicher le Roux



The constellation of Triangulum



Andreas Cellarius Macrocosmica chart

TRIANGULUM

Three Stars in a Triangle

The Triangulum constellation, which appears to be suspended from the end of the Milky Way against the northern starry night sky, is easy to find with its triangular shape marked by alpha, beta and gamma Trianguli. The constellation is situated just east of the Andromeda constellation and therefore easy to find by reference.



Before the 17th century, Triangulum shared the area with a constellation known as Triangulum Minor, which consisted of iota 10 and 12 Trianguli, but was later incorporated in its totality with what is now Triangulum. The constellation is particularly well known in relation to the discovery of the minor planet Ceres Ferdinandea by the Italian astronomer Giuseppe Piazzi in January 1801, now known only as minor planet Ceres. It is approximately 945 kilometres in diameter, the largest of all the minor planets and orbits between the planets Mars and Jupiter.

Triangulum is home to a number of galaxies, but also surprises the observer with its beautiful star groupings, which are mostly known just as asterisms. In the south of the constellation, only a degree east of the constellation Pisces, the galaxy **IC 1731** is located. IC 1731 is just a whisper of light, small in size with a tiny nucleus. The star field is complex, since the bright star cluster **COLLINDER 21**, is very close to the galaxy and causes some identification confusion. The cluster, however, in a beautiful half-moon shape or lopsided horseshoe of sorts, is situated only 5' south of IC 1731. This grouping is one of the brightest clusters, and what is quite special is that the outstanding group of stars sparkle in starry colours ranging from golden-yellow through to orange. This outstanding asterism is now better known as Sir Patrick's Putter. Two galaxies to the west, NGC 672 and IC 1727, share this extraordinary star field.

Towards the far southern part of the constellation an outstanding asterism can be found. The grouping **TEUTSCH J0228.3+2947** was discovered by Phil Teutsch and includes the stars 12 and 13 Trianguli plus a handful of fainter stars. The galaxy NGC 953 is situated just 35' towards the east, indicating the direction to this special group of stars.

A controversial star group, catalogue as **NGC 843**, is situated only half a degree north of 5 Trianguli towards the central part of the constellation. It is listed in the book *Star Clusters* (Archinal & Hynes) only as three very faint stars of around magnitude 14.



NGC 925 – Photograph: Wikipedia

of the galaxy seen as a whole. The star field around houses quite a few bright stars accompanying the galaxy.

The northern part of the triangle constellation is the reference point for the galaxy **NGC 925**, approximately 2 degrees east of gamma Trianguli. The galaxy is large and extends in an east to west direction with a relatively hazy outer envelope and more so towards the north-western end. What stands out about this galaxy is that the nucleus displays a very elongated bar shape more than half the size



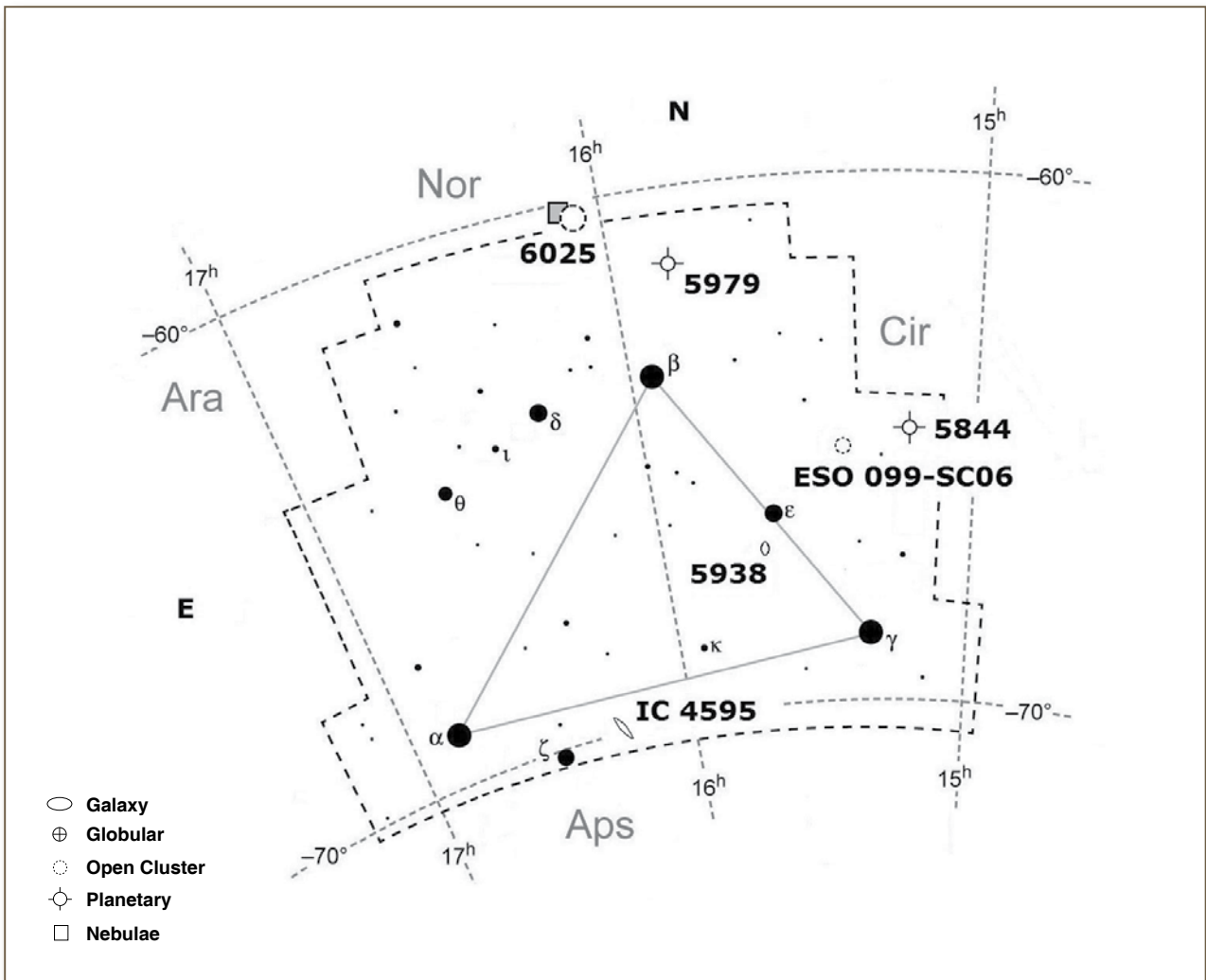
NGC 598 – M33 – Universe Today

The ultimate object in this constellation is the third largest member of our local galaxy group after Messier 31 and our own galaxy. **NGC 598** is well known as Messier 33, popularly known as the Pinwheel Galaxy, a satellite of M31 and 2.4 million light-years away. M33 is large in size, turned with its face towards us and therefore has a very low surface brightness, but as a bonus exposes the loosely wound spiral arms. A closer look reveals bright nebulosity patches, dark knots and lanes. A few HII regions are indicated with NGC and IC numbers, with the brighter emission patch catalogued as NGC 604 on the eastern edge. In photographs the galaxy displays an S-shape well outstanding against the hazy glow. Confusing is NGC 603, indicated only as a triple star, on the south-eastern edge.

The first quasar conclusively identified as such was discovered in Triangulum, 2 degrees north of M33. The quasar **3C 48** was the first in the Third Cambridge Catalogue of Radio Sources for which an optical identification was found by Allan Sandage and Thomas Matthews through interferometry in 1960. Thomas Matthews and Jesse Greenstein found that it had a redshift of 0.367, making it one of the highest redshift sources then known. It was not until 1982 that the surrounding faint galactic haze was confirmed to have the same redshift as 3C 48, cementing its identification as an object in a distant galaxy. This was also the first solid identification of a quasar with a surrounding galaxy at the same redshift. Three years later 3C 273 in the constellation Virgo was detected visually as a magnitude 13 object and it is still the brightest QSO known.

Perhaps the closest we can come to imagining the astonishing size of the universe is by trying to grasp something of the reality of how small we really are.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 598 Messier 33	Galaxy	01h33m.9	+30°39'.8	5.7	67'×41.5'
3C 48	Quasar	01h37m.8	+33°09'.5	16.2	0.6'×0.5'
IC 1731	Galaxy	01h50m.2	+27°11'.8	13.8	1.5'×1'
COLLINDER 21	Open Cluster	01h50m.2	+27°04'.7	8.2	7'
NGC 843	Group	02h11m.8	+32°05'.7	13.5	4"
NGC 925	Galaxy	02h27m.3	+33°35'.0	10	12'×7.4'
Teutsch J 0228.3+2947	Asterism	02h28m.3	+29°47'.8	8	17'



The constellation of Triangulum Australe



NGC 5844 – Photograph: Dale Liebenberg

TRIANGULUM AUSTRALE

The Useful Triangle

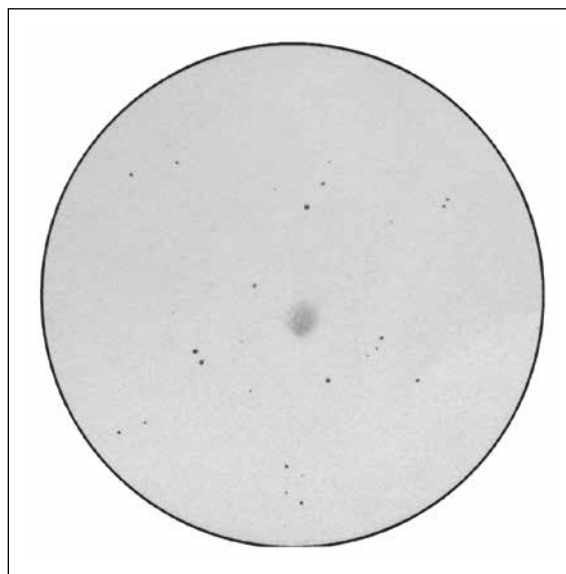
One thing that is as clear as starlight is the fact that many stars form triangles in the starry night skies. Whether the stars are faint or bright, seen with the naked eye, binoculars or through a telescope, the observer will find many triangles. The best known by far, and pre-eminently the most outstanding, is the Triangulum Australe constellation, which definitely displays the shape most excellently.



Triangulum Australe is situated between Ara, Apus, Norma and Centaurus. The three stars alpha, beta and gamma Trianguli Australis are quite outstanding and vary between magnitudes 1.8 and magnitude 2.8. Bayer called these stars The Patriarchs – Abraham, Isaac, and Jacob of old (*Star Names: Their Lore and Meaning* – Allen).

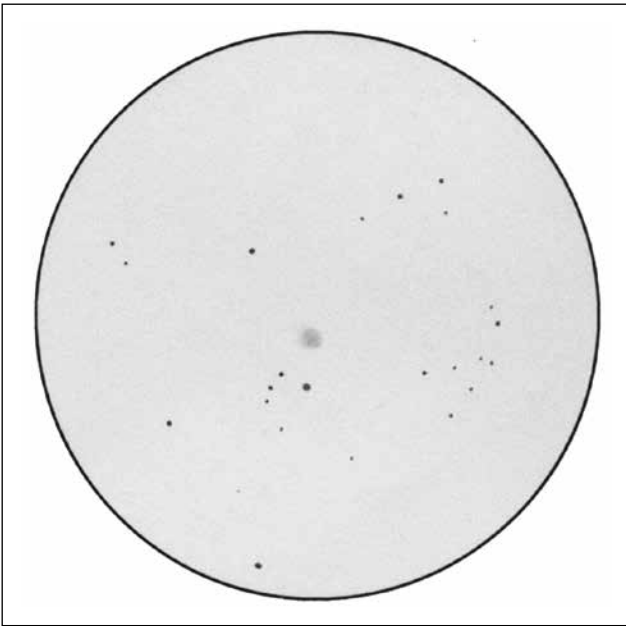
In the far western side of the constellation a special planetary nebula can be found.

NGC 5844 is a somewhat strange object which may, perhaps, give the observer the impression of a strange double planetary nebula, which it is indeed with PK 317.1-05.7 situated close to the north-western edge. The relatively bright object in a north to south direction with a washed-out northern side, displays something of an hourglass shape. It is by no means even in structure, but contains knotty patches which become more concentrated towards the middle area of the nebula. Close to the north-east edge is a very faint double star with another brighter pair south-east that lends a special effect to the field of view.



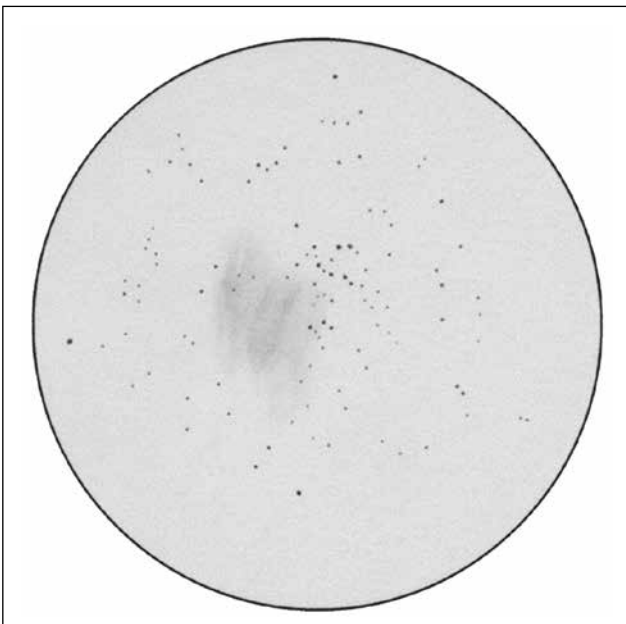
NGC 5844 – Planetary Nebula

About 2 degrees east a listed ESO object can be found. **ESO 099-SC06** displays a tight group of about eight stars that vary from magnitude 9 to 12 in brightness in an east-west direction. The brightest member in this tight grouping is GSC 9030 2526, the slightly yellow magnitude 9.9 star, which can be seen in the northern part of the cluster. However, brighter stars towards the east appear to increase the size of this grouping.



NGC 5979 – Planetary Nebula

The planetary nebula **NGC 5979** is situated 2.3 degrees north of the lovely yellow Beta Trianguli Australis and is visible only as a dense, fuzzy blue dot with a stellar core. Higher magnification, however, displays a very hazy, woolly edge. A few faint stars string away from the planetary nebula in a southern direction. Adding an ultra-high-contrast and oxygen filters help define this object in more detail against the busy star field.



NGC 6025 – Open Cluster

The famous open cluster because of its position close to the Great Attractor is **NGC 6025**. The object is situated on the border line with Norma clearly divided between both the constellations. However, it is been listed as an object in the constellation Norma. A typical stringy group with the northern part of the cluster slightly more condensed with brighter stars that display a sort of S-shape in a north to south direction. The cluster contains around 20 stars, with the outstanding Mq Trianguli Australis, a blue-white star in the southern part of the field of view. Careful observation

brings to the fore a piece of dark nebulosity intervening among the eastern star members.

The yellow coloured star delta Trianguli Australis is situated 2.2 degrees east of the northern corner star beta Trianguli Australis, which is also a double star, with magnitudes 3.9 and 11.9. The pair has a separation of 30" in a position angle (PA) of 120°.

Another double star is iota Trianguli Australis with a magnitude of 5.3, situated just 1.4 degrees further east. The double star, which shines in a beautiful dark yellow, has a plain white magnitude 10.3 companion. The separation is 19.6" in a position angle (PA) of 16°.

In line with the triangular shape of the constellation between the star's beta and gamma Trianguli Australis, the faint galaxy **NGC 5938** takes its place in a busy star field. This object is barely seen as a roundish glow with a sharp bright nucleus. Faint stars are more evident towards the south-eastern field of view.

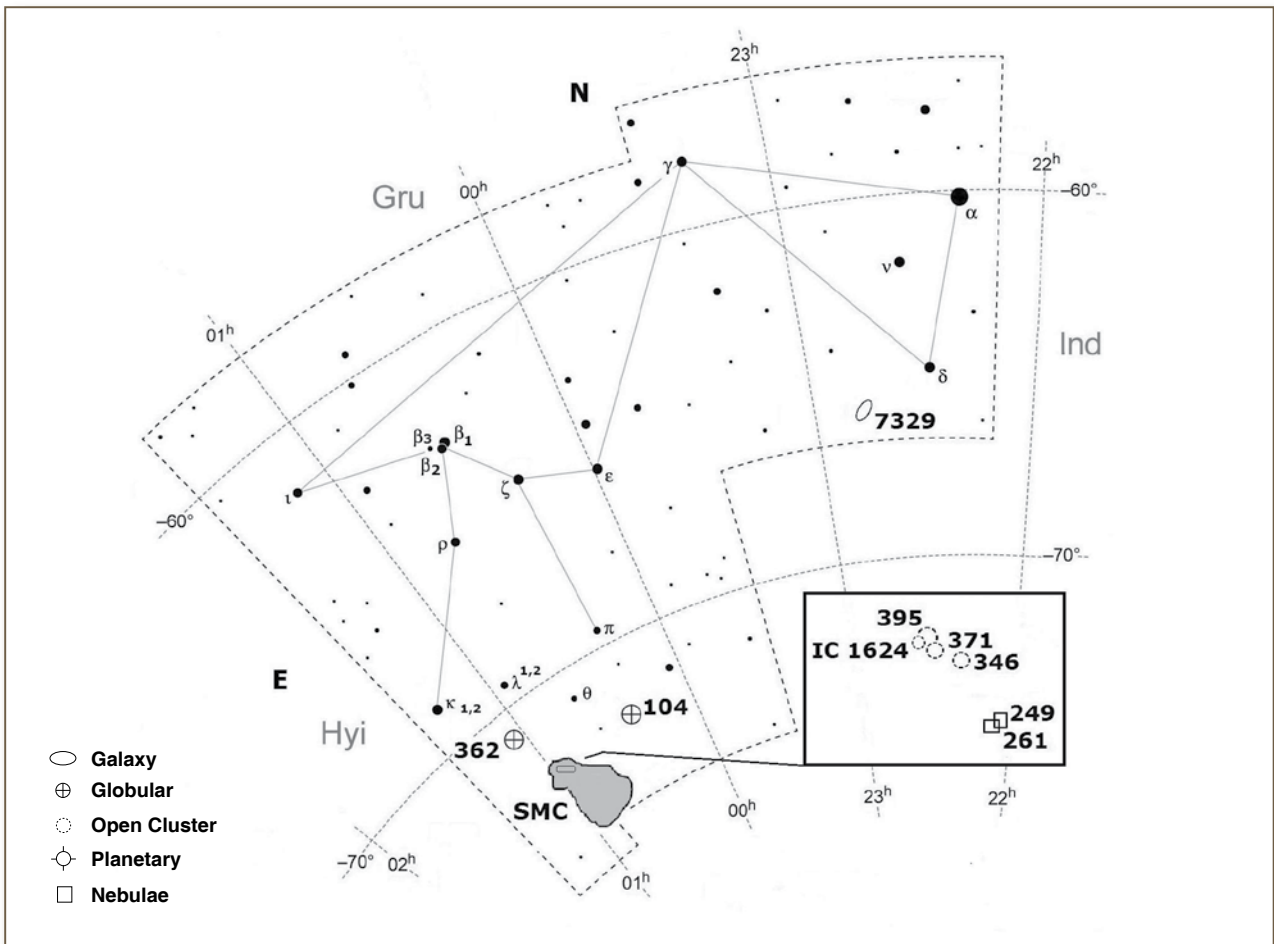
Another galaxy, **IC 4595**, is situated just 40' west of the lovely deep-yellow coloured zeta Trianguli Australis, which shines with a magnitude of 4.8. The galaxy is very faint, and averted vision provides the best tool to discover its hidden qualities. Situated almost on the southern border with Apus, the galaxy displays a faint sliver of a light ray in a north-east to south-west direction. With care a few faint stars can be spotted on its surface, with one prominent on the north-eastern tip.



IC 4595 – Photograph: astro-map

The good old triangular shape is easy to remember, and easy to describe as part of an observation with stars that splashed out in their thousands. Regard the triangle in a brand-new way and take special note of the constellation Triangulum Australe which shows off this well-known geometric shape in a very special way.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 5844	Planetary Nebula	15h10m.6	-64°40'.4	11.5	73"
ESO 099-SC06	Open Cluster	15h29m.8	-64°52'.0	7.9	8'
NGC 5938	Galaxy	15h36m.4	-66°51'.6	11.8	2.8'×2.5'
NGC 5979	Planetary Nebula	15h47m.7	-61°13'.0	12	10"
NGC 6025	Open Cluster	16h03m.7	-60°27'.8	5.1	12'
IC 4595	Galaxy	16h20m.7	-70°08'.6	12.7	2.7'×0.5'



The constellation of Tucana

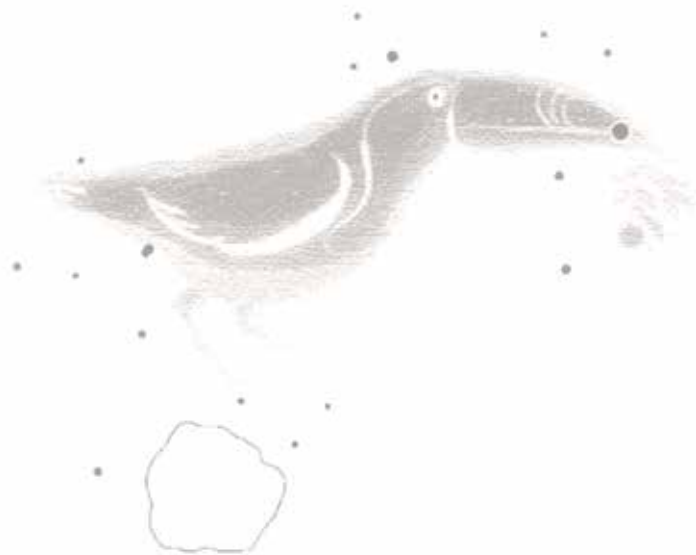


(Left) Nicolas Louis de Lacaille’s old notebook was found in the library of the Johannesburg University recently.
 (Right) Inscriptions inside Nicolas de Lacaille’s old notebook (source Constant Volschenk)

TUCANA

A Close Relationship

In the dark of the Bushveld it is just overwhelming to stare in amazement at the Magellanic Clouds. There is so much one can say about its beauty, uniqueness and the means to discover its hidden treasures. Observing them towards the southern summer nights provides an opportunity to try and bring the privilege of seeing them and grasping the reality a little closer together.



There is great belief now that the Small Magellanic Cloud (SMC) apparently consists of two separate galaxies in nearly the same line of vision, with the Mini Magellanic Cloud (MMC) at the back. The SMC is nearly 160 000 light-years from earth and 10 times smaller than the Large Magellanic Cloud. The Magellanic Clouds may end up colliding with our galaxy or leave our Milky Way surroundings never to return.

Towards the west of the SMC, the brightest stars of the constellation Tucana form a distinct kite shape. The most south-western corner features the double star delta Tucanae, which appears to be pale blue-white in colour with the fainter companion reflecting a soft yellow.

A barred galaxy, namely **NGC 7329**, is situated 2 degrees south from delta Tucanae and appears east-west in direction. The nucleus displays a definite bar which brightens considerably more to the centre. Spiral structure can be glimpsed with averted vision that makes the outer edge of the galaxy very flimsy and hazy. Be sure to seek out very dark skies and high telescopic magnification to bag this star city.

The constellation is named after the Tucana bird, and what an honour to be situated next to the SMC. The most easterly corner star of this bird impression is beta Tucanae, which displays a lovely combination of a dirty white primary opposed to the lemon tinged companion. This double system actually contains four stars in total. Another double star is kappa Tucanae situated just north of the SMC, and to my eye the most beautiful double star in the constellation. It displays a rich yellow colour in contrast to its fainter clear white companion.

Sharing the area around your telescope with a herd of buffalo requires extreme courage and of course an all-encompassing love of the starry night sky. Listening to animal sounds while observing is part of the privilege sharing the very dark starry skies with them. Well, turn a deaf ear to them, and to the far away cry of a jackal, because to explore the beautiful SMC hanging against the starry night sky like a hazy cloud is on the agenda.

In the northern fringe of the SMC there is a host of open clusters which are not at all easy to sort out. **NGC 395** spans a large area with several stars of various magnitudes in two parts. Closer investigation reveals pieces of faint nebulosity that wisp throughout the very faint light-pricks of star members. The core of unresolved stars shows a bright uneven dense middle part and a faint elongated hazy piece on the north-western edge. **IC 1624** is a small faint stringy patch of very faint stars situated south-east and virtually amongst the members of NGC 395. Faint stars run into the open cluster **NGC 371** which is about 20' to the south-west. The group displays a lovely resolved splash of stars, well intermingled with nebulosity. A deep sky filter brings to the fore a rich complex network of hazy parts. Take your time to discover a harvest of delightful objects in the SMC as there seem to be just too many to deal with.

NGC 346, also known as the Cloudy Cluster, appears as a large, elongated north-west to south-east stardust cluster covered in nebulosity. At first glance one can easily mistake this cluster for a barred spiral galaxy. Higher magnification reveals clumps of tight stars towards the middle area. With averted vision a dark patch can be glimpsed towards the western part, lifted out by the surrounding hazy extensions. An obvious double star is situated in the north-eastern fringes of the cluster.

Two emission nebulae can be found close together in the same field of view. **NGC 249** displays a faint circular glow which responds well with the use of an oxygen (O-III) filter. Higher magnification brings out some detail and structure on its surface. **NGC 261** the smaller of the two, is situated towards the south-east, intervened with a diffuse glow seen towards the middle area.



The Small Magellanic Cloud – NGC 362 (top left) – NGC 104 (top right)
Photograph: Dieter Willasch

I conclude my brave session with one, if not the best globular cluster, one of about 150 in our galaxy. **NGC 104** (47 Tucana), is an outstanding brilliant globular cluster, with approximately a million stars brought together through gravity. Globular clusters are aged objects, and NGC 104, as one of the larger ones, could be between 12 to 14 billion years old. A casual glance to NGC 104 through binoculars will bring a brilliant haze of starlight to your eye. However, the three-dimensional globular cluster becomes a shimmering ball of a thousand-and-one stars through the telescope. Plunge into the heart of the large inner core to discover a grainy texture, round in shape with crowded faint stars fighting for a place – the brilliant focus that makes NGC 104 so special. The second envelope bursts around the core and runs out to a hazy outer sandpaper impression. However, the north-east outer edge is slightly cut down in starlight with a dark gap. A sprinkling of star splinters enveloped in haze fills the field of view. With even higher magnification you become one of NGC 104 cluster members floating in space. What a remarkable object!

Nestled near the northern edge of the SMC is the bright globular cluster **NGC 362**, which can be seen with the naked eye. Through the telescope the centre displays a compressed star-like core. Higher magnification turns it into a smooth cotton ball, sprayed with well-resolved faint stars embedded in a hazy outer envelope. At even higher magnification, the core becomes granular, on the verge of resolving starlight. The pioneering French astronomer Nicolas de Lacaille first recognized this to be a cluster and not a single star round about the year 1752. Nicolas de Lacaille also discovered the objects NGC 2547 and NGC 3228 in the constellation Vela.



Nicolas Louis de Lacaille – Pencil Sketch : Kathryn van Schalkwyk

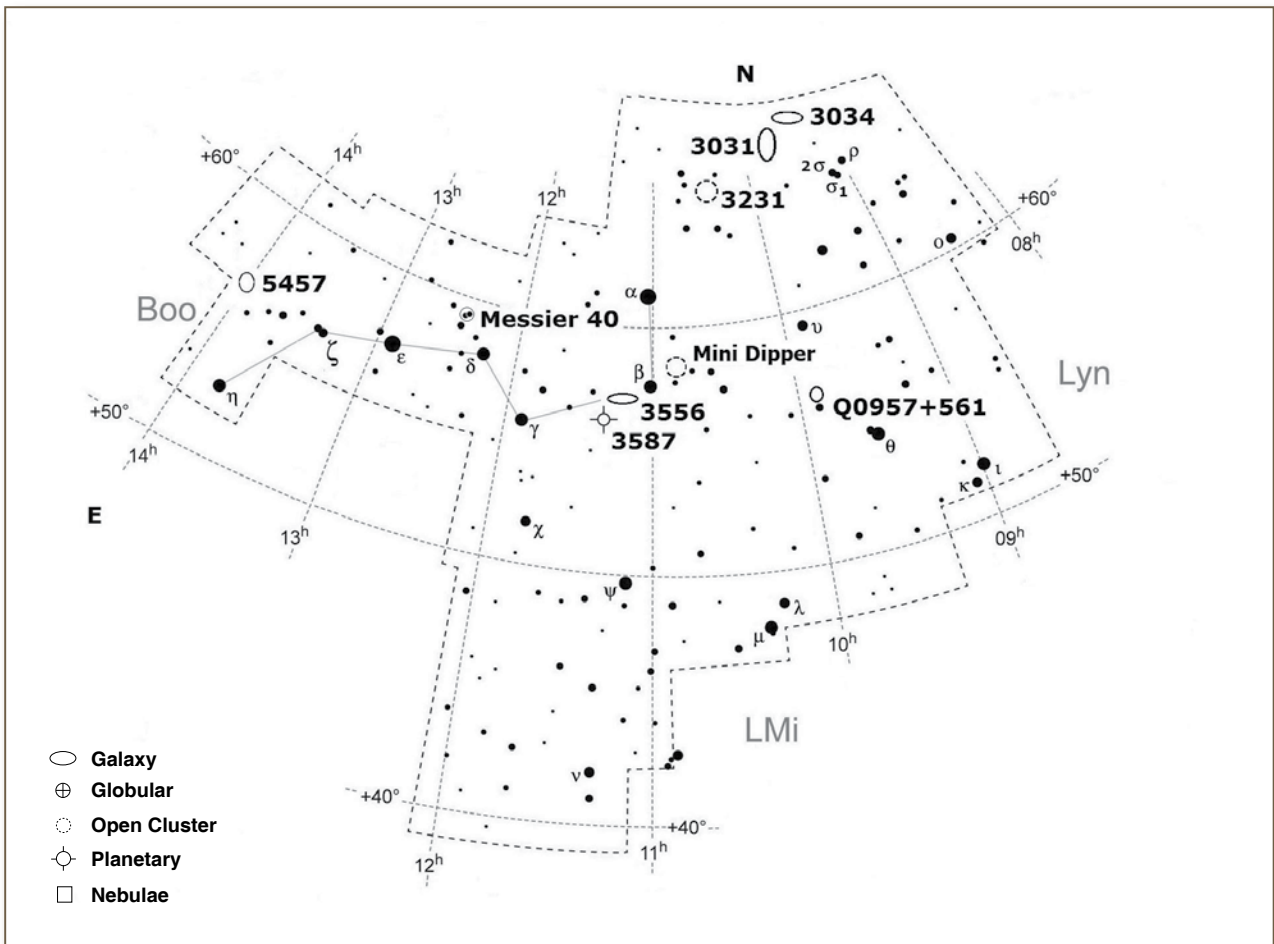
Nicolas Louis de Lacaille (1713-1762), the French astronomer observed the southern skies during his stay at the Cape of Good Hope during 1751 to 1752. He named 14 new constellations and created a list of 42 objects in his Catalogue Nebulae of the Southern Sky. He was regarded as the “Father of Southern Astronomy”.

Who said I was scared of wild animals? Purposely, I frighten away all the animals lurking in the dark as I wind my way to the kitchen for a cup of coffee and quick nap before dawn.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 104	Globular Cluster	00h24m.1	-72°05'.0	3.8	40'
NGC 249	Nebula	00h45m.4	-73°05'.0	12	1.9'
NGC 261	Nebula	00h46m.5	-73°07'.0	13	1.4'
NGC 346	Open Cluster	00h59m.1	-72°11'.0	10.3	5.2'
NGC 362	Globular Cluster	01h03m.2	-70°51'.0	6.5	12.9'
NGC 371	Open Cluster	01h03m.3	-72°05'.0	12	7.5'
NGC 395	Open Cluster	01h05m.3	-72°00'.0	9.6	2'
IC 1624	Open Cluster	01h05m.4	-72°03'.0	12.9	1.7'
NGC 7205A	Galaxy	22h07m.5	-57°27'.0	13.6	1.2'×0.8'
NGC 7205	Galaxy	22h08m.5	-57°25'.0	11.1	3.7'×1.9'
NGC 7329	Galaxy	22h40m.5	-66°28'.0	11.8	3.2'×2'



NGC 104 – Photograph: Davis - NASA



The constellation of Ursa Major



NGC 5457 – M101 Photograph: Adam Block Caelum Observatory and Mount Lemmon Sky Centre, University of Arizona

URSA MAJOR

Plough Northwards

Ursa Major, the Big Dipper or Great Bear, also known as the Plough, is essentially a northern constellation. The Big Dipper refer to only the asterism of the seven brightest stars. The constellation is mainly a northern constellation and only just visible in the northern parts of South Africa as we approach autumn here in the southern hemisphere but is totally invisible from positions further south.

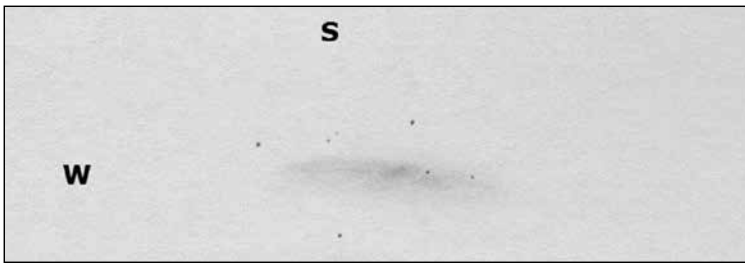


Thanks to my favourably situated northern observatory the greater part of the constellation's seven brightest stars, representing the shape of the Big Dipper, are visible to me as a bonus. The central five stars of the Big Dipper all belong to the Ursa Major moving cluster, also known as Collinder 285.

The handle of the Big Dipper asterism is quite easy to see, with three prominent stars swinging out from the main feature. The star zeta Ursa Majoris, also known as Mizar, and its naked eye companion, Alcor, the magnitude 3.9 north-eastern star, are located centrally in the handle's bend. However, the magnitude 2.2 Mizar itself is also a true binary with its companion star just 14" to the south-east, the first to have been found through a telescope in 1662 and also the first binary to be photographed, in 1857. Johann Liebknecht nicknamed this double star 'Ludwig's Star' in 1722 in honour of Landgraf Ludwig V of Hessen-Darmstadt.

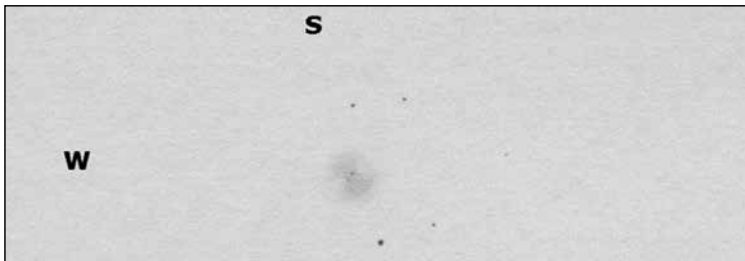
During my visit to a northern hemisphere astronomy camp I had the privilege of studying parts of this constellation that aren't clearly visible from the southern hemisphere. To see those northern hemisphere constellations invoked in me a feeling of having lost my way among the stars, and my eyes kept wandering southwards trying to locate those more familiar sights. Indeed, seeing Cepheus, Draco, Camelopardis and Ursa Minor was quite strange. The camp which is situated in the lovely countryside of Portugal's Caldas de Monchique, offered me the use of an 8-inch Schmidt-Cassegrain telescope with a magnification of 133X and 200X.

The four corner stars (alpha, beta, gamma and delta Ursa Majoris) of the bowl shape are most conveniently situated to point the way to some of the lovely deep sky objects. The stars alpha and beta are also known as the northern pointers because they point to the celestial north star Polaris.



NGC 3556 – M108 – Galaxy

NGC 3556, which is also known as Messier 108. This object was discovered by Pierre Méchain on 16 February 1871. It appears as a small, nearly edge-on oval in an east-west direction, with a barely brighter central part. With careful observation, faint dark patches become visible on its misty surface, with a more conspicuous patch just west of centre. A magnitude 12 star close to the galaxy's nucleus can easily be mistaken for a supernova. Surprisingly, pictures of M108 show a very elongated core.



NGC 3587 – M97 – Planetary Nebula

The unique planetary nebula **NGC 3587** also known as Messier 97 is situated only 48' south-east of M108 in the same large field of view. The Owl Nebula, as it is popularly known, appears larger than expected. A soft envelope enfolds this circular 3.5' roundish glow with a fairly low surface brightness. Two dark patches on either side of the nebula, diagonally towards the north-west and south-east positions, represent the owl's eyes so to speak. The halo's appears light grey in colour, with the northern and southern parts of the nebula slightly brighter but stood out well with numerous fine details. The central star shines weakly at magnitude 14, making it difficult to glimpse. In 1848 the dark patches, likeness to owl's eyes, presumably led the deep sky observer Lord Rosse to name the nebula as such. It is not clear if he gave the nickname but it has stuck ever since.

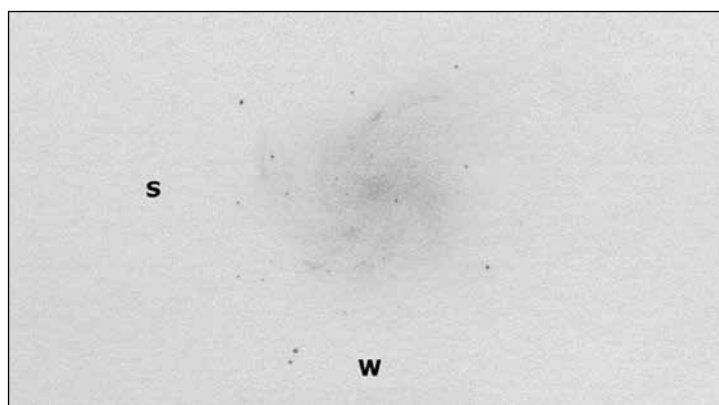
Sue French discovered an asterism 1.5 degrees west of beta Ursa Majoris, which she named the **Mini Dipper**. The brightest star, HD 93847, with a magnitude 7.4, is situated in the northern part of this grouping of seven stars.

The bowl asterism holds in its cup a few outstanding Messier objects and a huge number of galaxies in various categories. Magnitude 2.3 beta Ursa Majoris, the western corner star of the dipper bowl, is just 1.5 degrees west of the galaxy

The unique planetary nebula **NGC 3587** also known as Messier 97 is situated only 48' south-east of M108 in the same large field of view. The Owl Nebula, as it is popularly known, appears larger than expected. A soft envelope

One of the most inspiring and scientifically important objects is the quasar, **Q0957+561**, situated about 2 degrees west of the Mini Dipper asterism. The galaxy NGC 3079 points almost directly to the position of the Quasar a mere 10' to the north. The quasar is a single object but with the surrounding galaxies, which act as a gravitational lens, the quasar splits into two points of light barely 6" apart, although only one is the lensing galaxy. A very faint, massive galaxy is believed to lie in front of the southern component as seen from our viewpoint. The bending of light from more distant objects towards our line of sight was predicted by Albert Einstein in his General Theory of Relativity. The quasar's light has been travelling for approximately 1000 million years on its journey towards earth.

A lovely open spiral **NGC 5457** also known as Messier M101, is situated in the far eastern part of the constellation, and only 30' west of the border with the constellation Bootes. Also known as Messier 101, it is a lovely, large, open spiral galaxy, gradually extending its light to the exterior with a fairly bright large centre and smaller

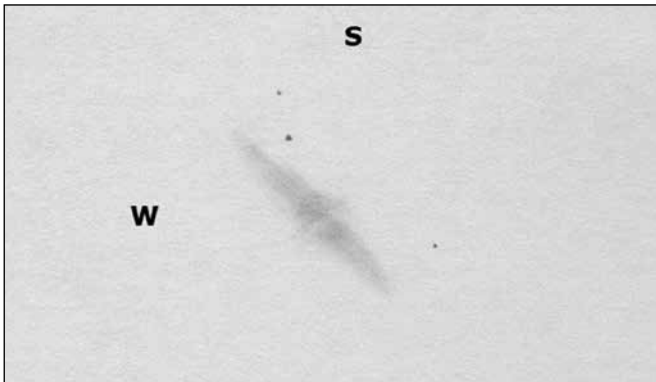


NGC 5457 - M101 - Galaxy

nucleus. What makes this face-on spiral so special is the mottling and nebulosity embedded in the dusty surface. In excellent dark night sky conditions, the faint spiral structure appears like flimsy, curved streaks of nebulosity. A considerable collection of faint stars can be glimpsed as part of the galaxy. It is estimated that M101 is somewhere in the region of 15 to 20 million light-years distant. Several supernovas have been recorded in this galaxy in the past 50 years. Pierre Méchain found both M108 and M101 with a 3-inch refractor from Paris, France, and added them to the Messier list of objects in 1781. However, Méchain announced his discovery of M102 as an error, declaring it to be the same object as the preceding number M101. Although the issue should have been resolved, controversy remains, with NGC 5866 indicated as the most possible candidate for M102. NGC 5457 is a face-on spiral in Ursa Major with a low surface brightness and more diffused than NGC 5866 in the constellation Bootes, which on the other hand is a relatively bright lenticular oval shaped galaxy.

Now for a few objects that most definitely could not be observed from our southern hemisphere. The magnitude 3.2 delta Ursa Majoris, points the way to **MESSIER 40**, which definitely comprises just two stars. The two magnitude 9 stars are 49" apart, with the western component a fraction brighter. The galaxy NGC 4290 is situated barely 10' towards the west, showing the way. Even though M40 is only a double star, it was still important to confirm an observation. The northern observers didn't find me smart or amusing for my so-called double star observation. However, I realised that M40 is inaccessible from the southern hemisphere, and needed to complete the Messier list.

The open star cluster **NGC 3231** is located in the far north of the constellation and displayed a very loose grouping slightly elongated in a north-west to south-east direction. Two magnitude 7.5 stars stood out very prominently at both the north-west and south-east outer edges of the group with a core area consisted of fainter stars closer together.



NGC 3034 – M82 – Galaxy

Perhaps the best-known galaxies in the northern hemisphere are the close pair **NGC 3031** (Messier 81) and **NGC 3034** (Messier 82), almost at declination $+70^\circ$. What an absolute delight for this southern observer to be able to study these famous galaxies! M81 and M82 were discovered by Johann Bode on a cold New Year's Eve in 1774 and were added to Messier's list in February

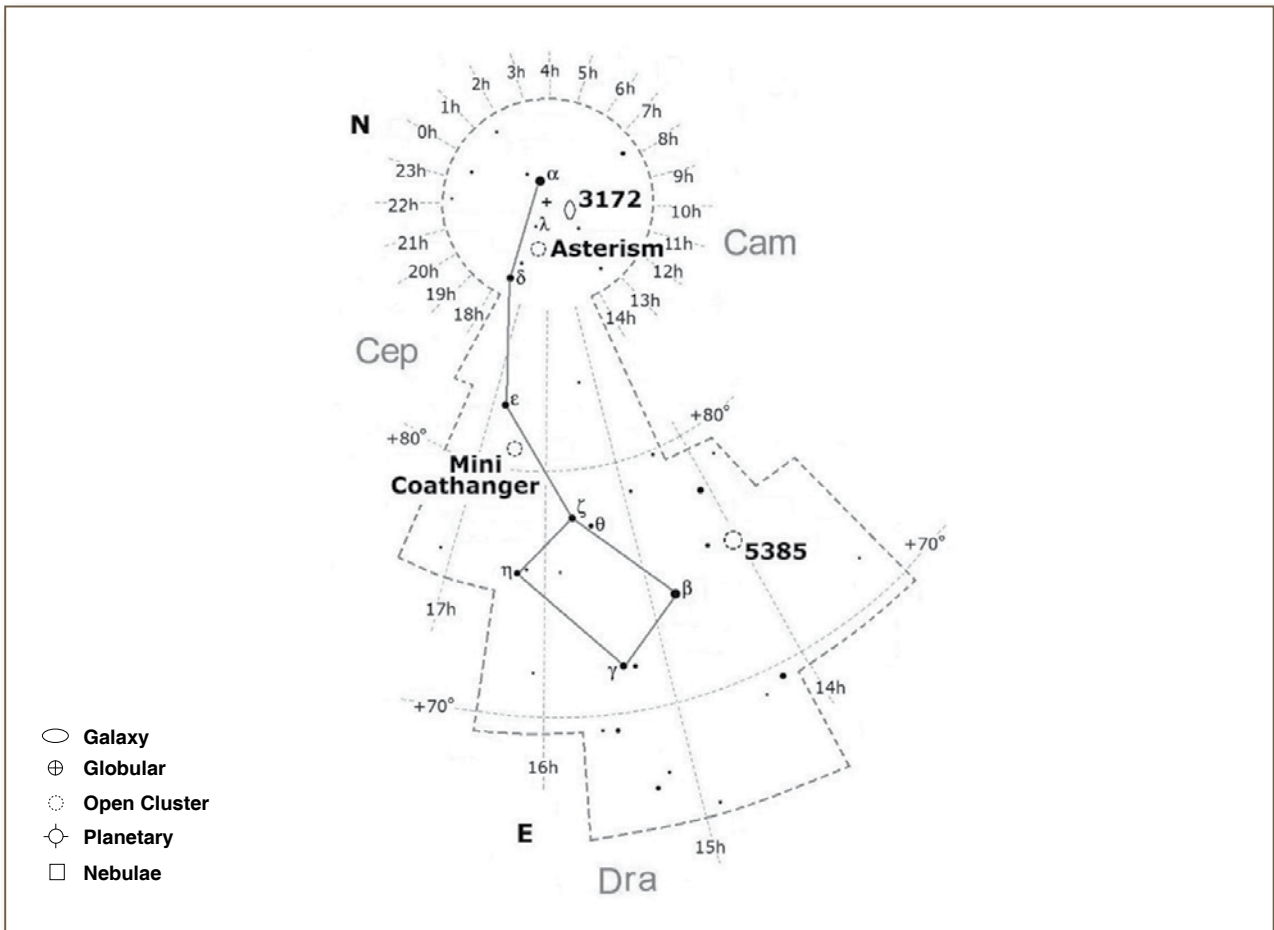
1781. They are part of the second nearest galaxy group, 10 million light-years distant after the Sculptor Group of Galaxies which is about 8 million light-years away and includes our own Milky Way. M81 appears as a hazy, large oval cloud in a north to south direction, which grows slowly brighter towards a non-stellar nucleus with a well-defined large halo. The flimsy exterior had me catching my breath with its beauty and resembled almost lacy streaks misting away from the core. M82 is located only 38' further north and is very different in shape. The outstanding brightness of this cigar-shaped galaxy took me by surprise. The high surface brightness is remarkable, with a nucleus that appears slightly off-centre towards the south-east. Clear in my mind to this day is the striking broken middle part which cuts the central area into two parts. The south-western part is considerably brighter and thinner than the mottled eastern part, which gradually disappears into nothingness. On my last night at the camp I repeatedly went back to observe these two galaxies over and over again!

During the flight back home, I pondered the beauty of the universe, and decided there was something unusual about friendships made through astronomy. Whether they are old or new friends, close or far abroad, they always share astronomy endlessly. There is an old song that goes: "South of the border, down Mexico way...." – or is it "South Africa way", because that is where I fell in love with the stars.

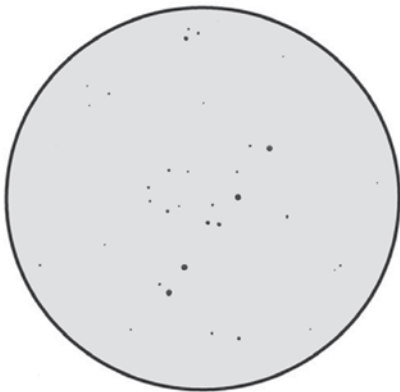
OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 3031 Messier 81	Galaxy	09h55m.6	+69°04'.0	6.9	24'×13'
NGC 3034 Messier 82	Galaxy	09h55m.8	+69°41'.0	8.4	11.2'×4.6'
Q0957+561	Quasar	10h01m.3	+55°53'.8	16.4	1'
NGC 3231	Open Cluster	10h26m.8	+66°48'.0	9	4'
Mini Dipper	Asterism	10h50m.6	+56°08'.0	6.8	15'×9'
NGC 3556 Messier 108	Galaxy	11h11m.5	+55°40'.2	10	8.6'×2.4'
NGC 3587 Messier 97	Planetary Nebula	11h14m.8	+55°01'.8	9.9	170"
MESSIER 40	Double Star	12h22m.4	+58°05'.0	9-9.6	49"
NGC 5457 Messier 101	Galaxy	14h03m.2	+54°21'.2	7.9	26'×27'



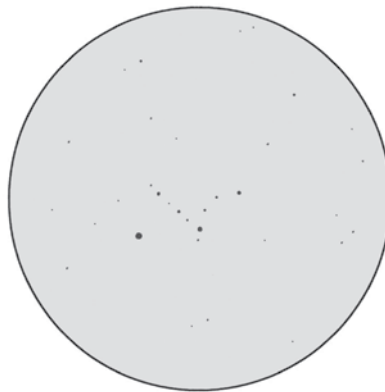
Astro Camp Portugal



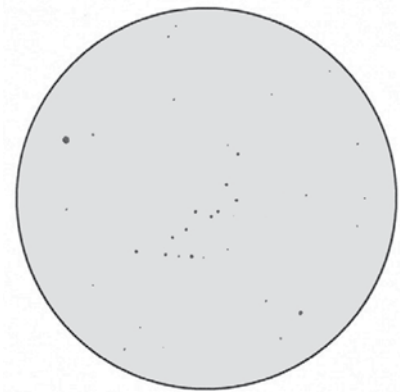
The constellation of Ursa Minor



Mini Coathanger



Asterism Polarissima



NGC 5385
Open Cluster

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 3172	Galaxy	11h47m.2	+89°05'.7	14.8	1'×0.7'
NGC 5385	Open Cluster	13h52m.5	+76°11'.2	10	7'
Star Group Polarissima	Asterism	16h29m.0	+80°15'.0	9	16'
Star Group Mini Coathanger	Asterism	17h13m.2	+87°57'.3	12	4'

URSA MINOR

The Pole Constellation

Astronomy friends in the north hemisphere can be rightly proud of their north star, Polaris, but the constellation Ursa Minor is impoverished as far as deep sky objects are concerned, but always above the northern horizon.



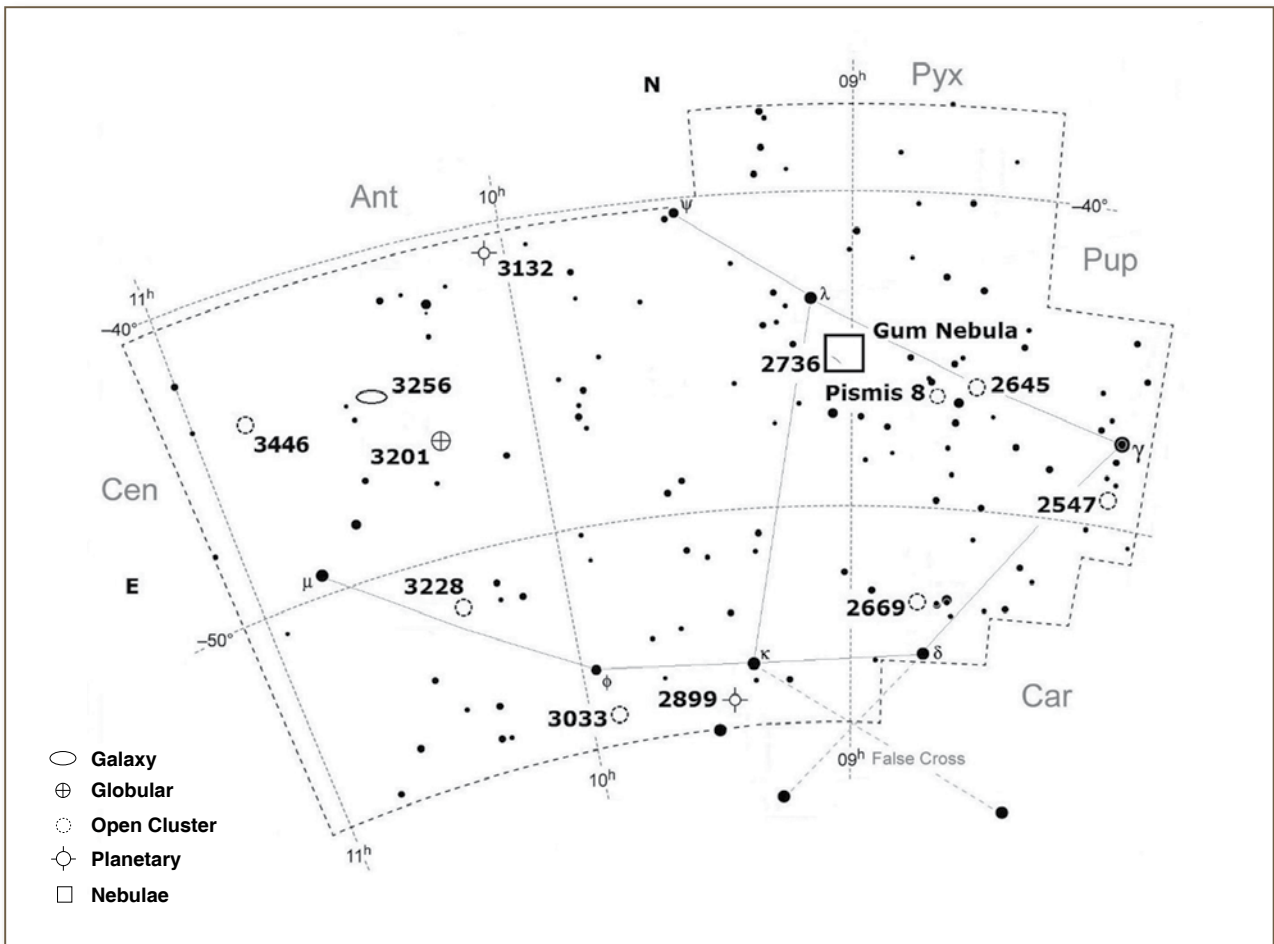
Ursa Minor is recognisable by a block of stars consisting of beta, gamma (a double star), eta and zeta Ursa Minoris. It is necessary to turn our gaze in that direction, as it remains the famous northern-most constellation, after all!

NGC 5385 can be described as an asterism, especially in that it tells a story. NGC 5385, I have named it the Skier which contains 12 relatively faint stars in a tight grouping, but is quite interesting. The starry skier is bent over backwards to the west and flat on its skate comprising five stars in a row from east to west. Although faint, this grouping is prominent against the background of even fainter stars. This lovely grouping is situated a degree east from the boundary with Camelopardalis.

The famous **Mini Coathanger** is a star group which, over and over, is a treat to observe and compares very well with the larger coathanger asterism, which can be found in Vulpecula and is labelled Brocchi's Cluster or Collinder 399. However, this mini hanger is situated 2 degrees south of epsilon Ursa Minoris and it was Tom Whiting who dubbed it the Mini Coathanger. The grouping, composed of a few stars, gives the impression of an old-fashioned coathanger with a metal hook. Seven stars make up the hanger, with three more stars forming the hook. It has a clear shape which appears from north to south and is well defined against the background star-field. There is a faint magnitude 15.2 galaxy classified as UGC 10447 situated on the edge of the hanger's neck.

Last but not least is **NGC 3172**, the closest galaxy situated only 1.5 degrees of the northern celestial pole. Although faint, it can claim the name Polarissima Borealis. The galaxy is slightly round in shape and slowly brightens up towards the middle. I found a lovely petite asterism 2 degrees from alpha Ursa Minoris, which I call Asterism Polarissima.

The constellation Ursa Minor, though some distance from us down south, none-the-less presents the observer with a few magnificent objects.



The constellation of Vela



Gum Nebula
 Photograph: CloudyNights

VELA

The Ancient Starry Ship

The constellation Vela was part of Jason and the Argonaut's vessel, originally named Argo Navis, used, among others, in the hunt for the Golden Fleece. Until 1750 this starry ship was one large and sprawling constellation when the French celestial cartographer, Nicolas Louis de Lacaille produced charts of



the southern hemisphere skies and dismembered it into four pieces: Puppis: the poop deck, Vela the sails of the mighty ship, firmly attached to Carina the Keel and Pyxis the ship's compass.

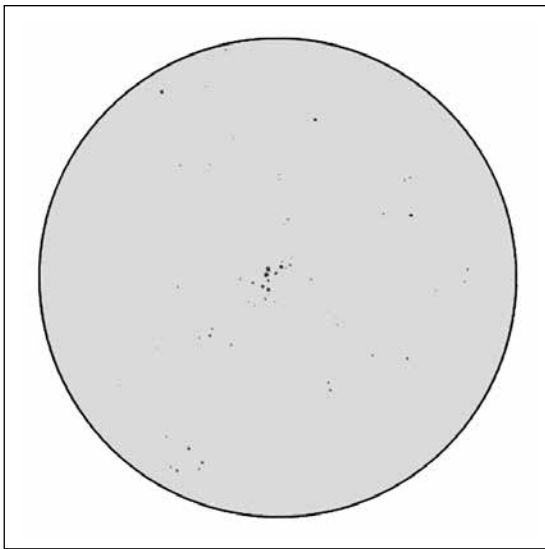
Vela is rich in a variety of deep-sky objects. This large constellation is not at all shy to show off its wonderful clusters and nebulae, besides other objects – far too many to deal with in one chapter. Such is the beauty of a constellation having the Milky Way as a close partner. There is no need to search out any objects – they are freely available.

The False Cross is found in the sails and consists of the star's kappa and delta Velorum, as well as the two borrowed stars iota and epsilon Carinae. Due to the subdivision of Argo, Vela has no alpha and beta star, but contains a few dozen stars brighter than magnitude 5. The star delta Velorum was found to be a double star as documented by Robert Innes in 1894, when the pair was widest apart in their 142-year orbit. When John Herschel undertook his southern sky-survey in the 1830s the pair was too close for discovery. In 1997 delta Velorum was found by the Galileo spacecraft to be the brightest example of an eclipsing binary with a 45-day period. The system is about 80 light-years away from us.

The far western part of Vela is marked by gamma Velorum, which is also the brightest star in the constellation. It is a double star with a magnitude 1.7 primary, the hottest and brightest Wolf-Rayet star in the sky. Since it has a separation of only 0.1", it is virtually impossible to split through ordinary telescopes. Interestingly, this double star is actually part of a possible five-star system.

On the south-western border, close to the constellation Carina, 1.7 degrees north of delta Velorum, the character-filled **NGC 2669** cluster takes up its seat. It is a very rich cluster, relatively compact, with a sort of V-shape pointing towards the south. What actually held my eye was the knot of faint stars in the eastern part, forming an eye-catching trapezium. The group Van den Bergh-Hagen 52 probably forms the northern part which extends away from the southern part. IC 2391 is situated towards the west.

The lovely, rich, open cluster, **NGC 2547** is situated 1.8 degrees south of gamma Velorum and is comprised of an uneven scattering of bright stars that mingle well with a mist of fainter members. The white coloured magnitude 6.4 star dominates the middle part, with two strings of fainter stars running across the group from north to south. The cluster contains about 100 members and is easily seen through binoculars.



NGC 2645 – Open Cluster

Draw an imaginary line from gamma to lambda and find halfway along it the lovely cluster **NGC 2645** which gives the impression of being suspended from the ropes of the sails like a lantern. Also known as Pismis 6, this very tight group of about a dozen stars is quite outstanding against the background starfield. It has a slightly elongated shape in a north-west to south-east direction. The woman astronomer Marie Paris Pismis carried out some of the first photometric observations in the early 1900s of young stellar clusters and discovered three globular clusters and 20

open clusters. She also studied the effects of interstellar absorption in these stellar associations.

The small group, **PISMIS 8**, is situated 28' east of NGC 2645. It is a special cluster with stars displaying shades of white and yellow in colour. The grouping is slightly curved in a north-south direction. Allowing my mind free rein I imagined seeing a MacDonald's "M" sign in the positioning of the stars. Perhaps I was just a little hungry at the time!

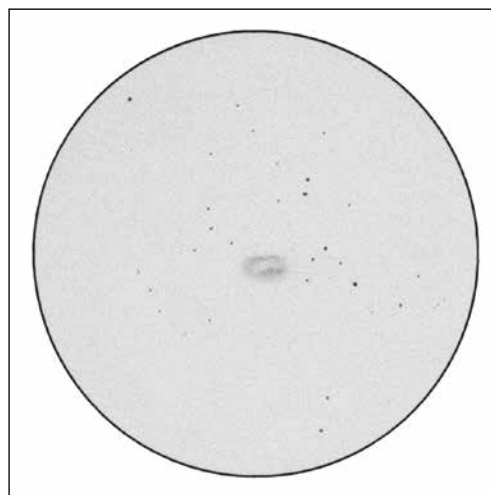
Vela is the proud possessor of the great Gum Nebula, higher up against the slopes of the sail, appearing to be caught up in the various nebulae and star groups. Its fine filaments form streams and loops of nebulosity indicated as Gum 12, 15 and 17. This complex named after the Australian astronomer Colin Stanley Gum, published this finding in 1955, and is thought to be one of the closest supernova remnants of just over a million years old.

Towards the south-eastern edge of this ancient supernova remnant is **NGC 2736**, a small flimsy streak of light. This emission nebula is more defined on the eastern side, with a hazy bulge out on the western side. The nebula, also known as the famous Pencil Nebula is counterpart to the well-known Veil Nebula, which is located in the northern constellation Cygnus. Although the name Pencil Nebula is appropriate, I love its other nickname designation Herschel's Ray best. The object was discovered by Sir John Herschel during his stay at the Cape of Good Hope.



NGC 2736 – Photograph: Dieter Willasch

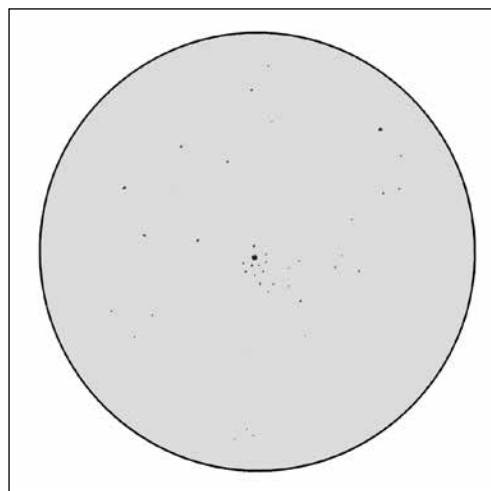
The easy visible glow of the planetary nebula **NGC 2899** is situated just south of kappa Velorum. However, high magnification is needed to truly observe detail and a hint of its shape. Add to this an oxygen filter (O-III) to reveal the nebula's kidney shape in an elongated east-west direction. With averted vision the nebula breaks down along its centre into a long thin opening and a dent, just visible towards the northern edge. The western and eastern sides are rather washed out.



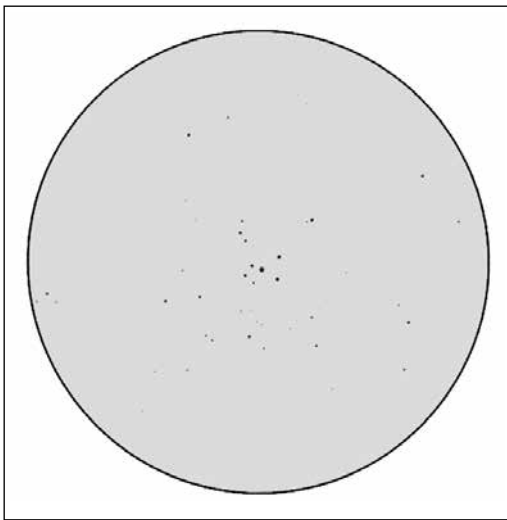
NGC 2899 – Planetary Nebula

Averted vision is gazing off to one side of the object to use your eyes' rods to detect faint light specks.

Just 2 degrees south of magnitude 3.5 phi Velorum in the far south-western corner of the constellation, a different kind of cluster can be seen in its mantle of stars. **NGC 3033** comprises about fifteen very faint stars, gathered around a prominent, yellow-coloured magnitude 6 star, creating a homely picture of a mother-hen with her chicks following her in a north-east direction. Quite amazing!



NGC 3033 – Open Cluster



NGC 3228 – Open Cluster

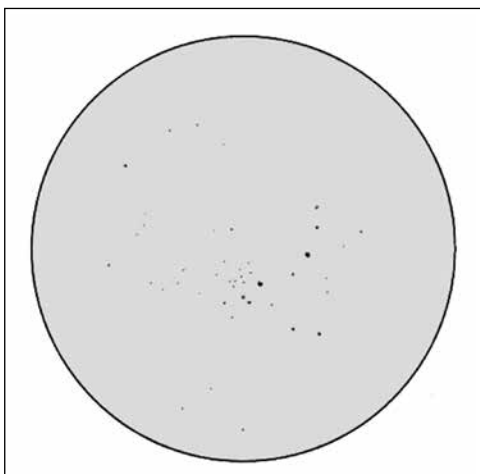
The open cluster **NGC 3228** is situated halfway between the magnitude 3.5 phi and magnitude 2.7 mu Velorum. It is an impressive small group of bright stars with a notable form that strongly reminds one of a daisy-flower, complete with a stem attached. The stars are unattached and strongly defined against the background stars. Towards the south of this little flower image, more stars can be seen that could be part of this group, giving it a north-south elongated shape in another context. Bright and clear, it is just like a summer daisy in bloom, despite its estimated age of about 42 million years!



NGC 3201 – Photograph: CloudyNights

Despite the scarcity of globular clusters in Vela, we find **NGC 3201**, an exceptional example, 5.8 degrees north-west of the magnitude 2.7 mu Velorum. It was found on 1 May 1826 by James Dunlop. The globular cluster can easily be spotted using binoculars in a relatively dark night sky. It displays a mass of delicate star-strings radiating away from the somewhat loosely concentrated core and spherical halo. Faint stars are widely dispersed towards the fringes

that extending into the rich star field. A few knots of faint members and dark patches can be detected inside the northern area. My attention was held by the dark lane towards the western extreme.

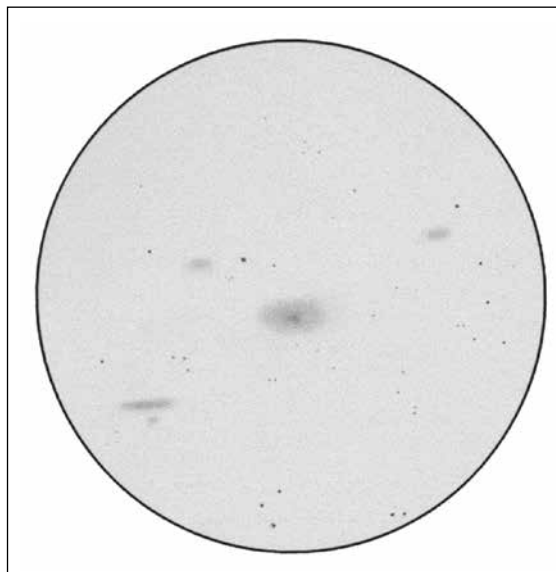


NGC 3446 – Open Cluster

The open cluster **NGC 3446** is situated 2.5 degrees west of the constellation Centaurus. It is a very small roundish grouping with the brighter stars in the western part. A more defined string curls out to the north. A handful of fainter members occupy the north-eastern side of the group from where they spray out in the field of view. The size of the entire group is unsure.

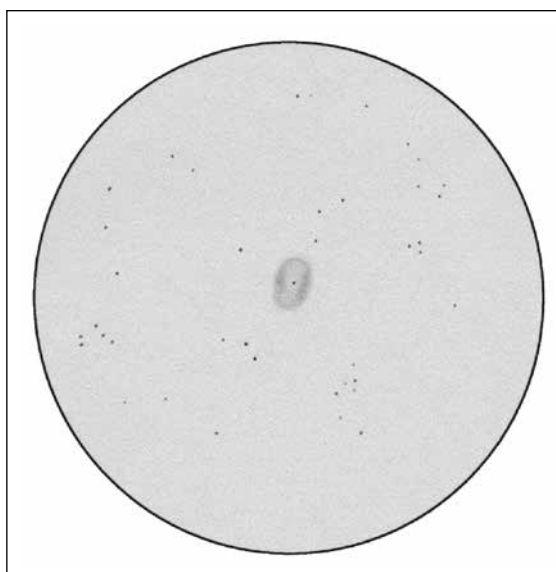
It is unusual to find galaxies so close to the Milky Way, yet Vela offers a dozen or more NGC galaxies in the eastern extreme of the constellation, spilling over into the constellation Antlia.

The **NGC 3256** group contains five galaxies, situated 3 degrees north of the globular cluster NGC 3201 and all of them covering an area of only 46'. NGC 3256 itself, the largest and brightest, has an oval shape in an east-west direction. Higher magnification reveals the galaxy's small stellar core, surrounded by a slightly brighter halo. The haziness around the north-western section of the oval extends slightly further north. NGC 3256C is the closest member but very faint, situated 18' to the north-east of the main galaxy. In the same field of view, NGC 3256A is a small oval in an east-west direction, 23' to the north-west of NGC 3256. The two galaxies, NGC 3262 and NGC 3263, are situated south-east of NGC 3256.



NGC 3256 – Galaxies

The planetary nebula **NGC 3132** is situated very close to the border with Antlia, only 4' inside the constellation Vela. This outstanding nebula appears as an oval ring in shape, with a sharply defined edge, slowly dimming towards the centre. The nebula reveals a structure that brings to mind a clown face of sorts, with the north-western and south-eastern edges fainter. It is also known as the Eight Burst and the Southern Ring. Instead of the characteristic blue colour this planetary nebula displays a pale grey to white colour.



NGC 3132 – Planetary Nebula

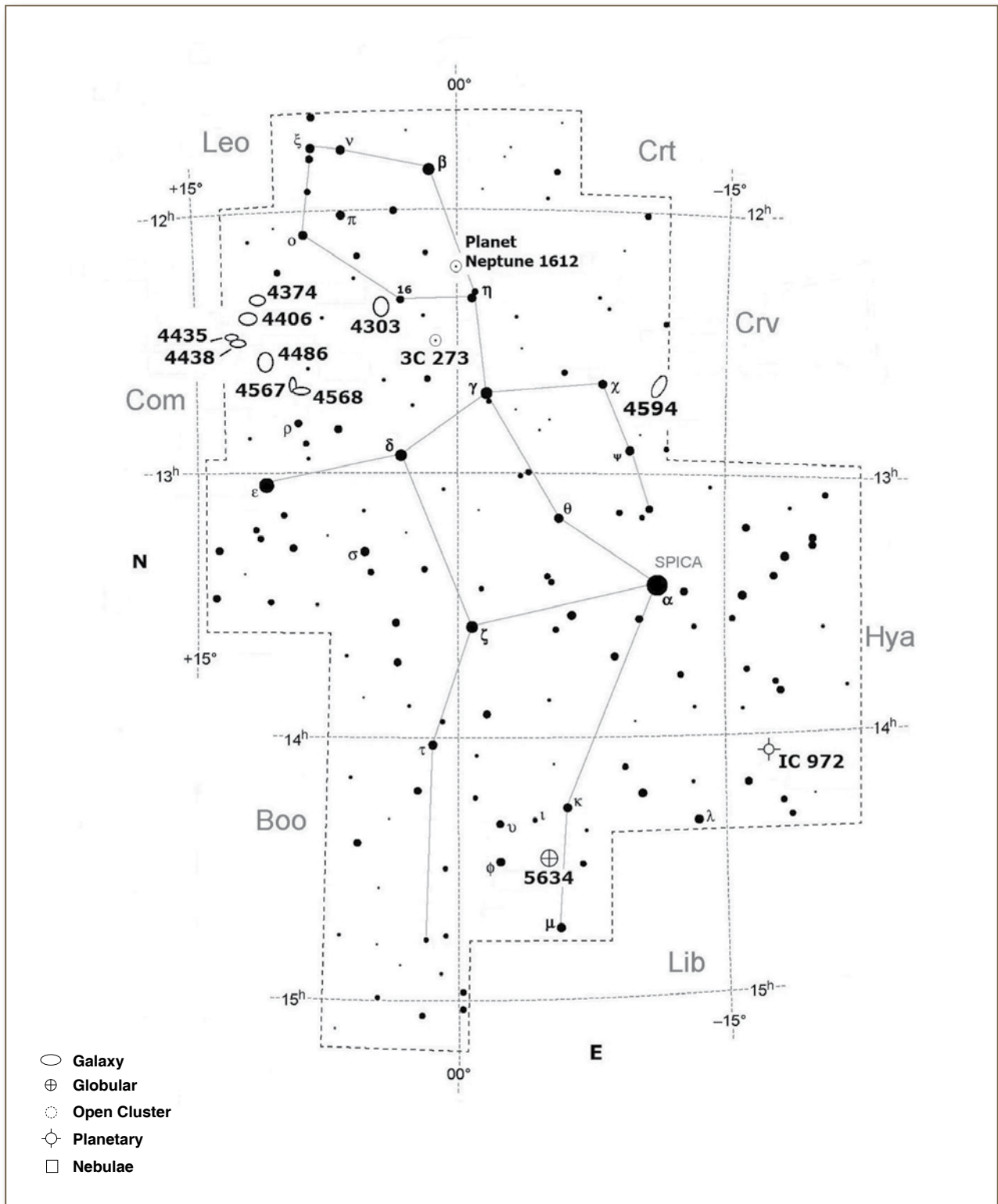
Cruising with the starry wind, the bow of the ship appears filled with jewels and the constellation Vela is more than willing to engage in a generous sharing of these deep sky treasures with those who choose to feast their eyes on them.



Paris Marie Pismis – Pencil Sketch: Kathryn van Schalkwyk

Paris Marie Pismis was born on the 30 January 1911 in Ortakoy, Istanbul, and died on 1 August 1999. She was a Turkish-Mexican astronomer of Armenian descent. In 1937, she became the first woman to get a PhD from the Science Faculty of Istanbul University. Pismis studied among others the kinematics of galaxies, HII-nebulae and the structure of open star clusters and planetary nebulae. She compiled the Pismis Catalogue of 23 clusters in the southern hemisphere.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2547	Open Cluster	08h10m.7	-49°15'.0	4.7	25'
NGC 2645	Open Cluster	08h38m.9	-46°13'.2	8	4'
PISMIS 8	Open Cluster	08h41m.6	-46°16'.0	9.5	3'
NGC 2669	Open Cluster	08h44m.9	-52°58'.0	6.5	12'
NGC 2736	Nebula	09h00m.3	-45°57'.0	10	20'×3'
NGC 2899	Planetary Nebula	09h27m.1	-56°06'.3	11.8	117"
NGC 3033	Open Cluster	09h48m.7	-56°25'.0	8.8	5'
NGC 3132	Planetary Nebula	10h07m.3	-40°26'.3	9.2	88"
NGC 3201	Globular Cluster	10h17m.6	-46°25'.0	6.7	18'
NGC 3228	Open Cluster	10h21m.4	-51°43'.0	6	5'
NGC 3256	Galaxy	10h27m.8	-43°54'.3	11.5	3.8'×2.1'
NGC 3446	Open Cluster	10h52m.3	-45°09'.3	8.7	2'



The constellation of Virgo

VIRGO

Her name is Virgo

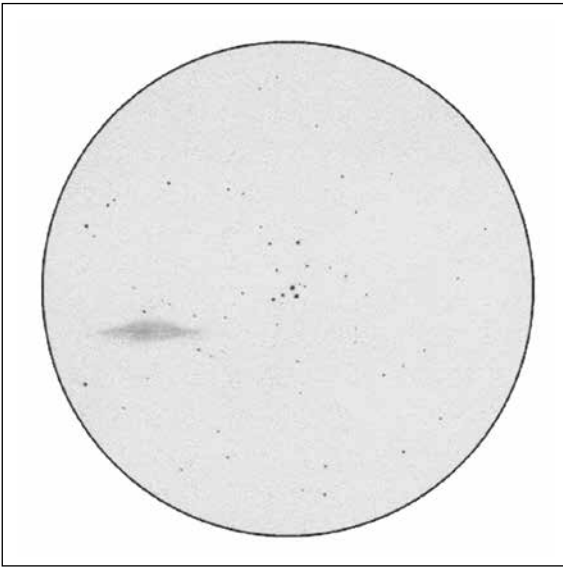
Late southern autumn is the best time to go galaxy-hunting. Not only is the Orion arm down in the west, but the Milky Way is still way down towards the east. The time slot gives us the opportunity for an intense look into the wide universe to observe the faint fuzzies, which are actually entire galaxies. You only need the use of a modest medium to larger telescope and dark starry skies. The constellation Virgo as most would agree, holds something mystical as it is filled with galaxies which are, in turn, also enveloped in a haze of unknown. Well, the truth is that the chaste young girl of the starry skies, so widely loved, was regarded as the virgin daughter of Zeus. In ancient times the importance of harvest time was reflected in the Virgo constellation, which is also referred to as the Maiden of the Harvest. The bright white coloured star alpha Virginis, better known as Spica, is said to represent the germ of the wheat grain. It is also a variable star that changes its light output every 4.1 days.



The constellation was even known as the Virgin Mary, mother of the child Jesus. Nevertheless, whichever name or myth you prefer, she holds in her lap a very rich harvest of galaxies that will keep you busy for quite some time. So, let us fire off with the Sombrero galaxy, **NGC 4594** (Messier 104), which was discovered in May 1781 by the Frenchman Pierre Méchain. M104 is possibly one of the brightest, biggest and versatile galaxies in the Virgo-Coma Super Cluster of Galaxies and is situated virtually on the boundary between Virgo and the constellation Corvus. This bright east-west edge-on galaxy with a slight tilt of six degrees towards our point of view displays a prominent dark dust lane running through the major axis with an outstanding bulge and pointed ends. It is approximately 65 million light-years away and 135 000 light-years in diameter.



NGC 4594 – M104
Photograph: Dieter Willasch



NGC 4594 – M104 – Galaxy

Steve O'Meara, a well-known astronomy friend, notes that the galaxy displays a brilliant core that seems to illuminate the surrounding oval shroud from within, like a distant bonfire seen through thick fog. The sharpness of the tell-tale dark lane reveals the edge of the Mexican hat's brim. He goes on to say that with averted vision the eastern portion of the Sombrero's brim breaks up and flares into a wide brushstroke of light, which shines more brilliantly than the western portion of the brim. Obviously, Steve uses a larger telescope with high magnification in favourable dark skies, but agrees with

me that the galaxy could not be described better. A very fascinating asterism nicknamed Jaws accompanies M104 only 25' towards the west.

NGC 4406 – M86, NGC 4374 – M84
Photograph: Dale Liebenberg

Virgo is mostly popular for the Super Cluster of Galaxies situated mainly in the northern part, with the abundance overflowing into the constellation Coma Berenices. The heart of this unique area filled with several galaxies is without doubt the two elliptical star cities **NGC 4406** (Messier 86), and **NGC 4374** (Messier 84), which are only 15' apart.

At first M86 appears to be a twin to M84, with its apparently round shape, but closer scrutiny reveals a slight oval in a north-west to south-east direction with a nearly stellar nucleus. Because M86's light is spread over a larger area, it appears slightly fainter than M84, but is in fact slightly brighter. This giant galaxy displays a bright small nucleus and a snowy frosted edge. It houses a large population of faint globular clusters orbiting the galaxy which serve as standard candles to determining galactic distances. The galaxy is about 55 000 million light-years distant, perhaps slightly closer to us than M84. Several other galaxies in the area, including M84 and M86, stretch a few degrees from north-east to south-west and have collectively been referred to as Markarian's Chain. The chain was named by the Russian Benjamin Markarian, who first noted this formation.

A very special pair of galaxies is **NGC 4435** and **NGC 4438**, situated barely 20' further east of M86. I remember very well the first time I laid eyes on this unique pair of galaxies during a visit to the Kruger National Park. At the time, listening to all the animal sounds in the dark of night, I imagined the pair to be two eyes staring back at me through the telescope eyepiece, notwithstanding the lion's roars in the distant. The southern member NGC 4438 is slightly larger, with an even surface brightness and a very hazy edge. With higher magnification a broad central concentration can be glimpsed. Although the northern member, NGC 4435, is slightly smaller, it is a tad brighter, with an outstanding stellar nucleus. Both galaxies, nicknamed The Eyes, face in a north to south direction.

A much talked about galaxy and one hard to miss is **NGC 4486** (Messier 87), situated another degree further south-east. It is a lovely outstanding elliptical galaxy (also known as Virgo A) with a bright nucleus. Numerous stars fill the north-eastern field of view. It is ranked as one of the largest visible galaxies with a dominant population of old stars. The nucleus contains a



NGC 4486 – M87 and NGC 4478 (bottom right)
Photograph: Dale Liebenberg

strong radio-active source and a curious straight thin stream of matter and dust that contains high-energy particles racing from the galaxy nucleus at close to the speed of light. Obviously, there is no chance even to glimpse this strange ray of light, but Dale Liebenberg's photograph shows it faintly. The nucleus black hole was imaged using data collected in 2017 by the Event Horizon Telescope, with a final, processed image released in 2019. In the immediate field of view many galaxies can be spotted that indicate, more or less, the centre of the Virgo Super Cluster.

This is only the tip of the proverbial iceberg, yet even this leaves a stunning expression on the observer. Sometimes people shy away from observing galaxies, but careful map work and summaries of brightness will make observation considerably easier.



NGC 4567 and NGC 4568
Photograph: Dale Liebenberg

However, still on your way, another 2 degrees further south-east, the very interesting merging galaxies **NGC 4567** and **NGC 4568**, also known as the Siamese Twins, portray the vastness of the universe in a very special way. The American deep sky author Leland S. Copeland dubbed it as such in 1955. NGC 4568 the eastern and larger member appears to be surrounded by a hazy envelope and faces north-south. It gets gradually brighter

towards a relatively large nucleus. NGC 4567, the slightly smaller galaxy in comparison, has a dense bright pin-point nucleus. The interacting spiral pair are gently joined at their north-eastern tips. Barely 10' towards the north is another companion member NGC 4564.



NGC 4303 – M61 – NGC 4301 (top left)
and NGC 4292 (top right)
Photograph: Dale Liebenberg

NGC 4303 (Messier 61) is one of the largest spirals, and is situated a degree north of 16 Virginis and 5 degrees of magnitude 3.8 eta Virginis. The galaxy displays a barred face-on in a slightly north-east to south-west direction with a stellar core and hints of mottling on the surface. With even higher magnification and a relatively larger telescope try to glimpse the dark streaks between the arm sections and the nucleus. The galaxy is situated about 50

million light-years distant and to me is one of the most outstanding deep sky objects. According to astronomers it is not known why the central bar in some spiral galaxies rotates around the disc at speeds different from that of individual stars.

A very peculiar object is the quasar **3C 273**, the brightest example of its kind and situated about halfway between eta and gamma (Porrina) Virginis in a triangle towards north. The quasar is just 8' south of a pair of magnitude 10 and 11 stars and just 40' west of the galaxy IC 3474. The slightly bluish object appears brighter and hazier than the accompanying stars in the field of view. 3C 273 is a very luminous object with an enormous red shift discovered by Halton Arp in 1966. With a magnitude of 13 it is not easy to detect through ordinary telescopes.

In the midst of the galaxy domain we find **IC 972**, a lonely planetary nebula in the far south-eastern corner of Virgo. IC 972 could well be a very faint galaxy by the looks of it, not at all easy to glimpse and probably, with a magnitude of 14, out of observational reach for most. Larger telescopes, however, and high magnification will reveal a slight hazy edge around an out of focus star. IC 972 is the 37th entry in George Abell's catalogue with a nebulous structure.



IC 972 – Photograph: phys.ttu.edu

Another surprise to be found is the globular cluster **NGC 5634** taking shelter at Virgo's feet half way between mu and kappa Virginis. This globular cluster is relatively easy to observe and displays a hazy glow that grows gradually brighter towards a very compressed, unresolved broad centre. Faint star outliers, barely seen on the northern and southern edges, spiral out into the field of view. A spaced triangle of faint stars can be seen towards the western edge with a magnitude 8 orange-coloured star that dominates the eastern periphery.



NGC 5634 – Photograph: Dale Liebenberg



(5) Astraea compared to the largest asteroid Ceres
Photograph: Wikimedia Commons

On the night of 22 May 2002, I took part in an occultation of the star HIP 75185, in the constellation Libra, by the asteroid (5) Astraea done by Albert Brakel, from Australasia, and myself from South Africa. It was successful and the asteroid diameter came to 162 km × 96 km. I laid eyes on (5) Astraea again on the night of 7 May 2008 when this main-belt asteroid was drifting through Virgo about a degree west of the lovely yellow gamma Virginis. The asteroid (5) Astraea was accidentally discovered by Karl Hencke in December 1845 while he was searching for the asteroid Vesta.

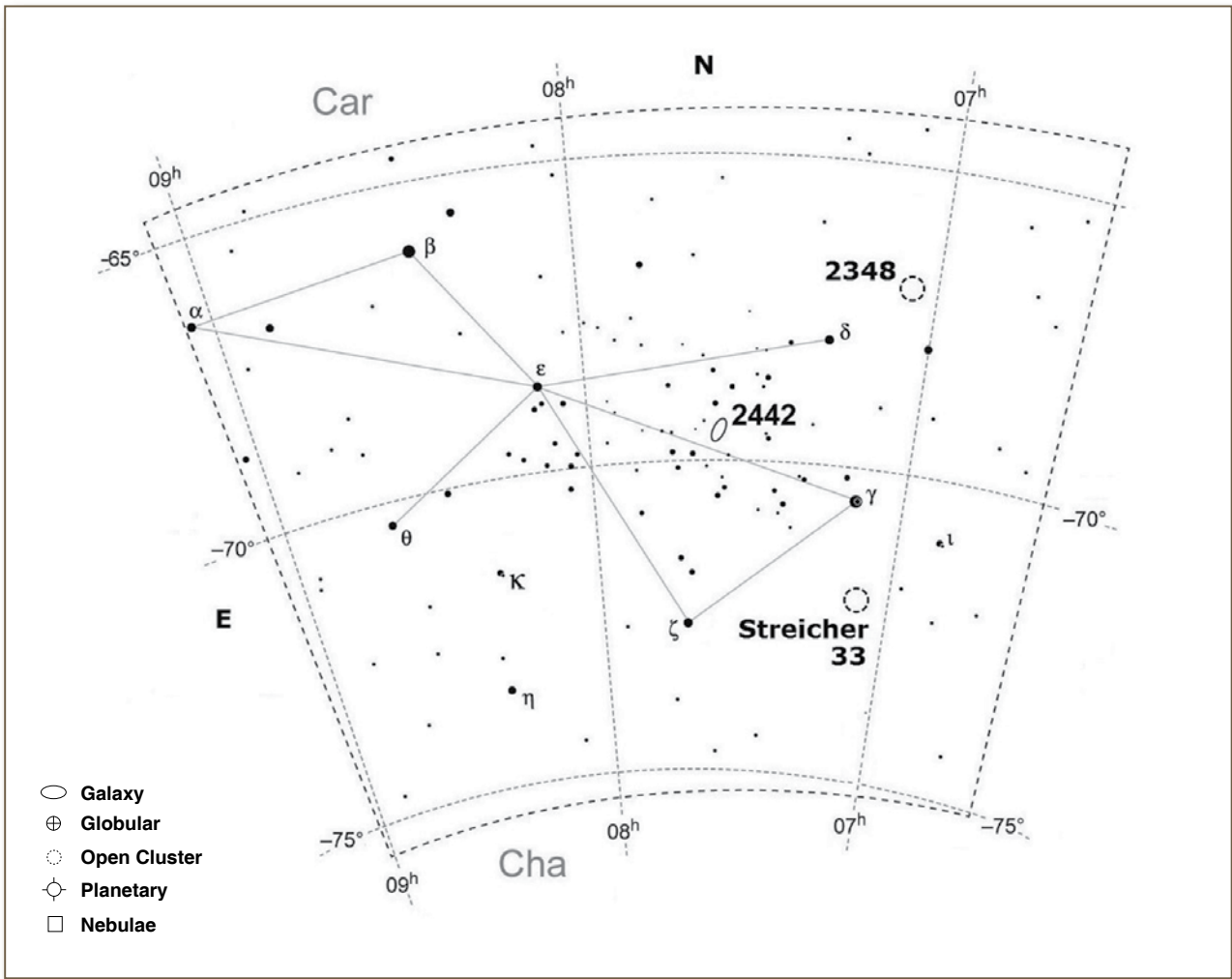


Neptune – Photograph: Wikipedia

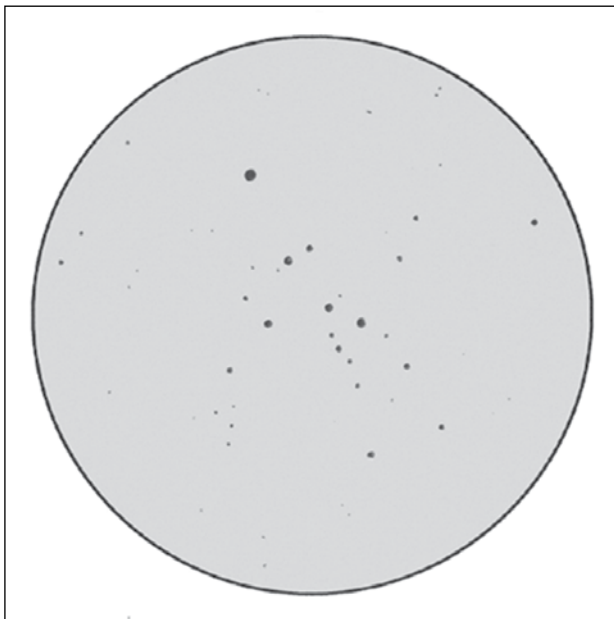
The planet Neptune was seen in Virgo about 20' east of the magnitude 6-star HD 105374, and 2 degrees west of eta Virginis by Galileo Galilei in December 1612. He also detected the motion, but probably could not believe it was a new planet. J.G. Galle of Berlin Observatory actually found and confirmed such a planet in the constellation Aquarius on 23 September 1846.

Dress up snugly and warmly, make yourself a flask of coffee and sit down with the lady Virgo to seek out those faint, misty clouds that are, in fact – almost unbelievably – entire galaxies.

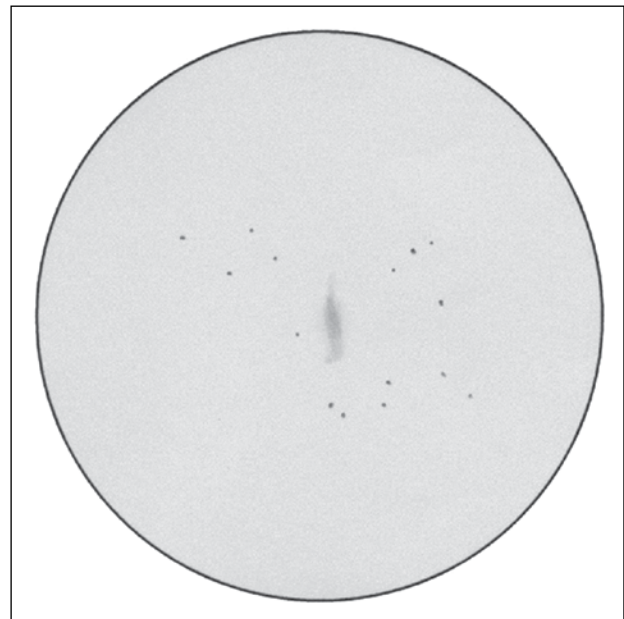
OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 4303 Messier 61	Galaxy	12h21m.9	+04°28'.4	9.7	6.5'×5.8'
NGC 4374 Messier 84	Galaxy	12h25m.1	+12°53'.2	10	6.5'×5.6'
NGC 4406 Messier 86	Galaxy	12h26m.2	+12°56'.7	9.7	8.9'×5.8'
NGC 4435	Galaxy	12h27m.7	+13°01'.0	10.8	3.2'×2'
NGC 4438	Galaxy	12h27m.8	+13°01'.0	10.2	8.9'×3.6'
3C 273	Quasar	12h29m.1	+02°03'.1	13	15" +/-
NGC 4486 Messier 87	Galaxy	12h30m.8	+12°23'.4	9.5	8.3'×6.6'
NGC 4567	Galaxy	12h36m.5	+11°15'.1	11.3	3.1'×2.3'
NGC 4568	Galaxy	12h36m.6	+11°14'.3	10.8	4.6'×2.2'
NGC 4594 Messier 104	Galaxy	12h39m.8	-11°37'.4	9.2	7.1'×4.4'
IC 972	Planetary Nebula	14h04m.4	-17°14'.7	14	43"
NGC 5634	Globular Cluster	14h29m.6	-05°58'.6	9.4	4.9'



The constellation of Volans



STREICHER 33 – Asterism



NGC 2442 – Galaxy

VOLANS

A Fish with Wings

The constellation was originally named Piscis Volans to immortalize the flying fish seen by the European mariners during their explorations of the tropical oceans.

In the northern part of the constellation the cluster **NGC 2348** displays a lovely combination of many stars between magnitudes 11 to 13 in a large roundish shape. Prominent in this grouping is a star string running through the dense middle area from north to south. However, the cluster could be a much larger as the indicated size.

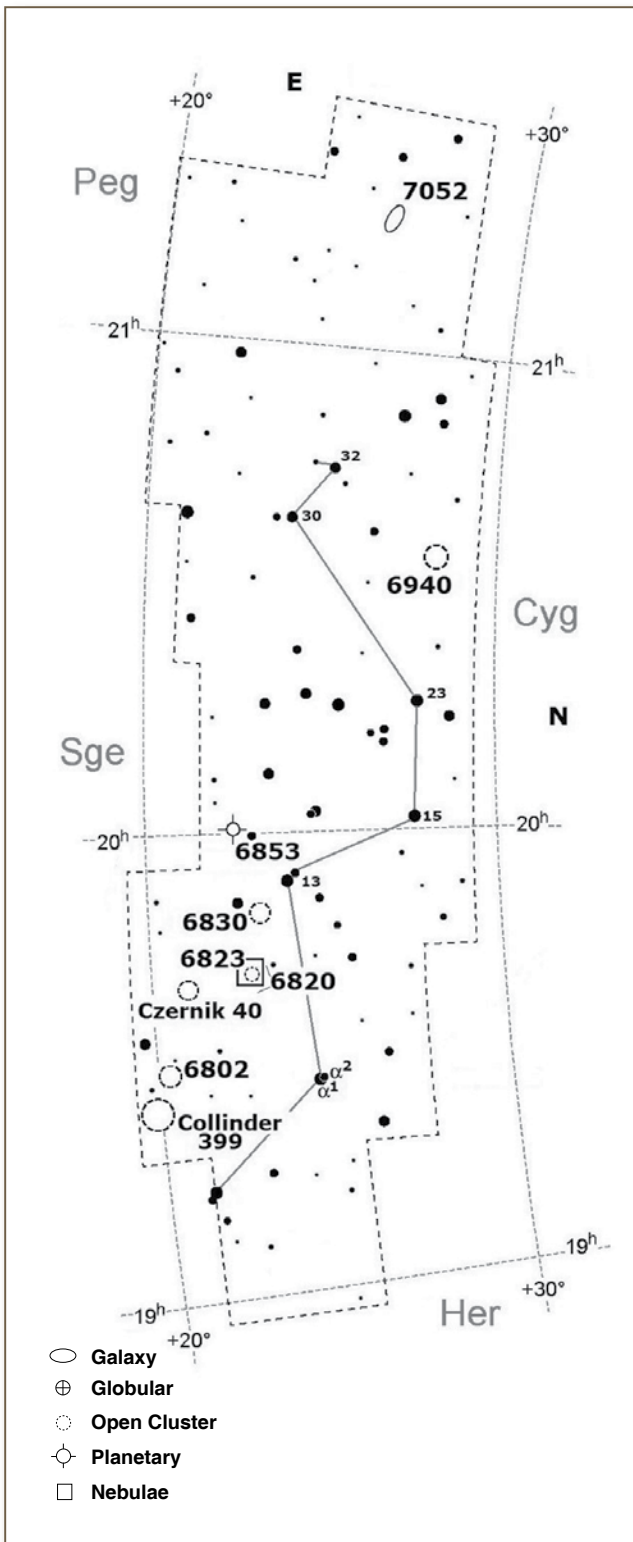


Further south the asterism **STREICHER 33** are, astonishingly, in the shape of a stick-figure Jumping Jack. The magnitude 8 star HD 56480 on the south-eastern tip forms the head, with the rest of the figure extending north-westward to complete the body and well-defined stiff legs. The field of view consists mainly of yellow and orange-coloured stars.

A well known galaxy is **NGC 2442** to explore - quite easy to spot as a hazy oval mist in moderate telescopes and dark skies. The nucleus is outstanding and with high magnification dark patches can be discerned on the surface. With careful observation the galaxy displays its famous unmistakable S-shape. A wisp of light curls out from the nucleus and extends with a swing towards the south-east, which can only be part of the spiral arm. Apparently there is a double star in front of the galaxy which could have had an effect on the shape of the nucleus. John Herschel discovered this galaxy in 1834 and thought it was a double nebula with "some sort of hooked appendage". Follow the faint stars northwards to glimpse the faint round smudge of galaxy NGC 2434.

Deep sky dreams are made of objects flying away to the deep oceans of the universe.

OBJECT	TYPE	RA	DEC	MAG	SIZE
NGC 2348	Open Cluster	07h03m.2	-67°23'.7	9	12'
STREICHER 33	Asterism	07h08m.9	-72°14'.3	8.5	18'
NGC 2442	Galaxy	07h36m.4	-69°31'.5	10.4	5.4'×2.6'



NGC 6802 – Photograph:
W Calvin College Observatory

The constellation of Vulpecula

VULPECULA

Why a Fox?

Not only is this the last constellation of 88 to have been named, but the name given to it is not exactly very flattering either. And yet, the celestial fox brings exceptional objects to the fore to justify its place. Hevelius said that he wished to place a fox in the sky because this animal is very cunning, voracious and fierce.



Start at the tail end of the fox with a surprising and unexpected object, the galaxy **NGC 7052** in the eastern part of the constellation. It is rather faint and has been described as slightly elongated in shape with a hazy appearance and a dust lane embedded almost edge on. But do not be disappointed if you cannot glimpse this star city – the starry fox will rise to the occasion with much more than a faint galaxy.

A rich open cluster, **NGC 6940**, half a degree in size, is riding on the back of our heavenly fox. A large, roundish swarm of stars of various magnitudes is situated not far from the border with Cygnus. Fainter members form short strings and knots between members. With careful observation a few dark areas can be glimpsed.

A beautiful petite cluster, **NGC 6830**, can be found a degree south of 13 Vulpeculae, a rich patch of stars quite outstanding against the background star field. Every cluster tells a story, and this one brings to mind many thoughts because its shape resembles a chicken footprint, or an X shape formed by slightly brighter stars in its midst. A trapezoid of stars flanks the eastern part of the grouping.



NGC 6830 – Photograph:
astro.dur.ac.uk

Two objects further west can be observed in one, although it is not an easy task to spot both. The cluster **NGC 6823**, is a lovely rich grouping consisting of colourful pairs and star strings. It is embedded in a veil of nebulosity which is being listed as the emission nebula **NGC 6820**, but the nebulosity is only observable in very dark skies and with the use of various filters.



NGC 6853 – M27
Photograph: Dale Liebenberg

One of the most celebrated planetary nebulae known to nearly all of us is **NGC 6853**, familiarly known as the Dumbbell Nebula. Charles Messier observed and catalogued the nebula in 1764 when he spotted it and recorded it as object Messier 27 in his famous list of objects. The planetary does not disappoint in any way. It is bright, large and presents itself as a prominent hourglass shape with a frosted

light grey colour – in one word: magnificent! The two lobes that gave rise to its name are situated in a northern and southern position, with the southern part slightly brighter. With care, the central star can be seen surrounded in a light transparent haze. M27's distance has been measured reasonably accurately as being about 300 light-years away, with an age of 20 000 years. Its surface is very hot, with a temperature of about 85 000 Kelvin. This high temperature releases tremendous amounts of ultraviolet radiation which excites M27's gases to glow.

The open cluster **CZERNIK 40** can be describe as only a loose spacious grouping of various magnitude stars. However, asterisms are surely some of the most interesting star groupings to discover and observe. One such, named the mini dragonfly, is on the southern edge of the open cluster. It may be that the listed CZERNIK 40 and this asterism are one and the same object. However, it is a very realistic asterism, which is worthy of its name, about a dozen outstanding stars in an east-west direction. The dragonfly's tail is formed by the brighter stars towards the west with the two magnitude 9 stars on the south-east that mark the dragonfly's mismatched eyes. The curly wings run out with fainter stars towards the north-east and south-west. One stand amazed by the realistic appearances of groupings like this.

Not to upset the fox too much, move towards the area indicated as its head with alpha Vulpeculae as its red, furious eye. **NGC 6802**, is an open cluster like no other and fascinating to observe with its starlight reflecting a story-telling experience. The creative feeling of looking back from above on approaching a distant town with flickering lights enveloped in mistiness. One could dredge into the reality of this little star town covered in a mist of rain, topped with a hazy glow of light pollution and draped against the background of a distant dark mountain.

Even more realistic is one of the best-known asterisms in the northern hemisphere situated virtually in the south-western corner of the Vulpecula constellation. The grouping, known as **COLLINDER 399**, or the Brocchi Cluster, is no other than the famous Coathanger Cluster. What a lovely group of stars, which can be seen with the naked eye as a hazy patch in truly dark skies and appears very realistically as a coathanger with the aid of binoculars. The Persian astronomer Al-Sufi was the first to mark the group. In the early 20th century the astronomer Dalmiro Brocchi charted the group. In 1931 Swedish astronomer Per Collinder included it in his catalogue of clusters as Cr 399. It includes the stars 4, 5, and 7 Vulpeculae and is one of the oldest clusters on record. The Hipparcos satellite put it as just a chance alignment of stars.



COLLINDER 399 – Photograph: Dale Liebenberg

OBJECT	TYPE	RA	DEC	MAG	SIZE
COLLINDER 399	Open Cluster	19h26m.2	+20°05'.8	4	58'×36'
NGC 6802	Open Cluster	19h30m.6	+20°16'.2	8.6	3.2'
CZERNIK 40	Open Cluster	19h42m.6	+21°09'.2	9	6'
NGC 6820	Nebula	19h43m.1	+23°17'.0	7.6	40'×30'
NGC 6823	Open Cluster	19h43m.1	+23°18'.0	7.1	12'
NGC 6830	Open Cluster	19h51m.1	+23°04'.3	7.9	12'
NGC 6853 Messier 27	Planetary Nebula	19h59m.6	+22°43'.4	7.6	348"
NGC 6940	Open Cluster	20h34m.6	+28°18'.4	6.3	31'
NGC 7052	Galaxy	21h18m.6	+26°27'.5	12.4	2.5'×1.5'

Hunting History

Don't we consider the various astronomy catalogues to be there for just normal practice? William, his son John and sister Caroline Herschel, and others, were at the forefront of creating and compiling such a historical legacy. I developed an appreciation and was compelled to follow in the footsteps of astronomy history in England.

There is but one London and even in the wet gloom, this pulsating city is an intense experience. The beautiful green parks, with water fountains, create an air of tranquility. The plane trees shower the sidewalks with a golden carpet of autumn leaves, and I remember the cold I could hardly bear at the time.

Big Ben proudly announces the time as I stand in front of the door of the Royal Astronomical Society in Burlington House, Piccadilly. The librarian, Peter Hingley (who died in 2012) was a friendly man with first-hand knowledge of astronomy and the history behind it. The library with thousands of books, some in leather jackets, is packed to capacity and as expected stacked to the ceiling, which is in itself an imposing sight. A cast iron staircase leads upwards towards more books.

The original Herschel manuscripts are stacked on a shelf and are worth millions. My historical quest begins with a 1543 manuscript by Copernicus, magnificently colorful, that exhibits the solar system. Not only is it extremely valuable, but it is filled with masterpieces on paper. I am fortunate to hold in my hand the exquisite light brown leather-bound manuscript used by Edmond Halley to indicate that the tail of a comet always faces away from the Sun. Peter carefully removes a sketch of the Moon from its cardboard protection; the periphery blackened by touch and partly worn away. This is Giovanni Domenico Cassini's 1670 pencil moon masterpiece with a small imprint of his wife on the side of Mare Imbrium towards the Promontorium Heraclides. She must have been an ongoing inspiration in his life.

The council chamber creates thoughts and visions of meetings held over numerous years. Einstein's theory was acclaimed here as "one of the greatest achievements of human thought". Decorating the walls in this chamber are two oil paintings of David Gill and Sir George Airy.



With a feeling of indescribable expectation, I depart for my first appointment so-to-speak with Friedrich Wilhelm Herschel, born 15 November 1738 and died 25 August 1822. My destination was 19 New King Street Bath, where William resided many years ago. Bath, a world heritage site, is a beautiful Georgian city with delightful crescents, terraces and architecture situated in the south-west of the country. William moved to London in 1757 and anglicized his name to William Frederick Herschel.

The first-floor displays William's passion, with various original telescope mirrors of polished speculum metal. There is a replica of the reflecting telescope used by William on the eve of 13 March 1781 when the planet Uranus was discovered by him. He began his famous manuscript "*Review of the heavens*". His sister Caroline, his ever-present



assistant, stayed with him and made notes of everything that passed before his eyes. William discovered thousands of double stars, clusters and nebulae, yet he never discovered a comet.

Numerous original books and framed manuscripts can be seen against the walls. The original staircase that leads to the music room brings a strange feeling – when I think that William once used it. William's old wooden kit rests against the side wall, and was used by his son John during his journey to South Africa in 1834.



The floor of the workroom on the ground floor is full of cracks and has been left like that as evidence of his numerous trials and failures in the fusing of hot metal mirror. From there I gain access to the garden where I stand contemplatively, thinking that it is here where this new world first shone its light through the lens of a telescope.



William Herschel – Pencil Sketch: Kathryn van Schalkwyk

The next important assignment on my tour was to visit the resting place of William Herschel. My concerned friend Jean, asked her friend Alan to accompany me to Slough which is situated on the outskirts of London.

After a few hours of hurrying behind him as he indicates the way, we arrive in Slough having travelled by bus, fast and slow train. The taxi driver is astounded when I ask to be taken to the



oldest church in Slough. He tries to explain that there are a lot of old churches in Slough – which one could it be? “The one where William Herschel is buried”, I try again. Saint Laurence Church is definitely the oldest church that I have ever seen; it was built in the 16th century.

I am invited into William’s last place of rest by a heavy oval wooden door. A stained-glass window is dedicated to the memory of William Herschel. He was honoured and respected in Slough and given a resting place in the floor between the pillars in front of the altar. The Latin inscription on the stone reads: “H.S.E. Hic sepultus est = here is buried Guilielmus Friedrich



Wilhelm Herschel born 15 November 1738 and died 25 August 1822. Coelorum perrupit claustra = he broke through the barriers of the heavens”. As long as humanity lasts, William Herschel will never be forgotten.

Some of the oldest gravestones can be found right next to the church. John Herschel’s son, Alexander Stewart Herschel is buried in the church garden, but because of controversy no gravestone was erected upon his grave. What is however known is that Alexander became an expert in the study of meteors. An interesting fact to note is that, Saint Laurence Church was saved from total demolition in 1837 by a 50-pound donation.

Westminster Abbey provides eternal rest to a number of astronomers but this section was not open to the public at the time. John Herschel's resting place is in the north-west flank of the Abbey. With a serene face and ASSA pin on my jacket I address one of the men in their long gowns. He agrees and patiently waits while I make a pencil sketch of John Herschel's engraved stone tomb and gold plaque embedded in the floor of the church. Next to John, is the stone tomb of Charles Darwin. A few metres away, the very imposing monument tomb of Isaac Newton can be seen.

John Frederick William Herschel was born on 7 March 1792 at Slough, near Windsor Castle, the only son of his mother Mary and father William Herschel. He died at his home in Kent, on 1 May 1871 and was buried in Westminster Abbey on 11 May 1871.



John Herschel – Pencil Sketch: Kathryn van Schalkwyk

John Herschel spent the years 1834–1838 surveying the southern stars at the Cape of Good Hope. Incidentally, he could easily have found the planet Neptune, as on 14 July 1830 one of his sweeps took him within half a degree of the then, unknown planet. Explorer of the southern sky, and perhaps his greatest contribution to astronomy was the completion of his father's great task. In 1864 he published a catalogue of over five thousand nebulae and clusters; the predecessor of the New General Catalogue astronomers and amateurs still use today. He was knighted in 1831, and became President of the Royal Astronomical Society in 1848. John was a remarkably pleasant and friendly person, according to documentation.



Westminster Abbey Photograph:
Wikimedia Commons



Sketch of John Herschel's resting place
and headstone in Westminster Abbey

The southern countryside is green and lush, and on the flat plains and hills sheep graze in harmony. The grandiosity of Stonehenge leaves an unforgettable impression. It is the most important prehistoric monument in the whole of England. Astronomy friend Andrew, accompanies me and my daughter Belinda around the countryside, sharing a lot of history and many tales with us.



Against the ancient stones of Salisbury and Stonehenge.
Photograph: Andrew White

On our journey through the country we stay over in Oxford, without doubt one of the most breathtaking cities in England. Dominating the three-acre site of Green College is the eighteenth-century Radcliffe Observatory. The building functioned as an observatory from 1773 until 1934. Eleven of the twelve zodiac constellations decorate the front of the impressive yellow painted building. On the facade of the building one sees Scorpius and Libra still sculptured as one constellation.



Sir Edmond Halley was born on 8 November 1656 and died 14 January 1742. He was an English astronomer, mathematician, geometer, meteorologist and physicist.

Halley's house and observatory which is still in its original form is situated just next to the beautiful old Oxford city centre with its imposing buildings. I am momentarily halted in front of the door in the presence of another great name in astronomy. He used Isaac Newton's law of gravity to make the first accurate prediction of a solar eclipse.



Edmond Halley – Pencil Sketch: Kathryn van Schalkwyk



Edmond Halley, Savilian Professor of Geometry 1703-1742 lived and had his observatory (on top) in this house

On our last evening in London, Belinda and I ponder under neon lights, sitting flat on the steps of Piccadilly and sense the hustle and bustle of this unique city. In only 12 days I have lived an amazing starry tale, full of excitement and history that will not be forgotten soon.

A Woman Named Caroline Herschel

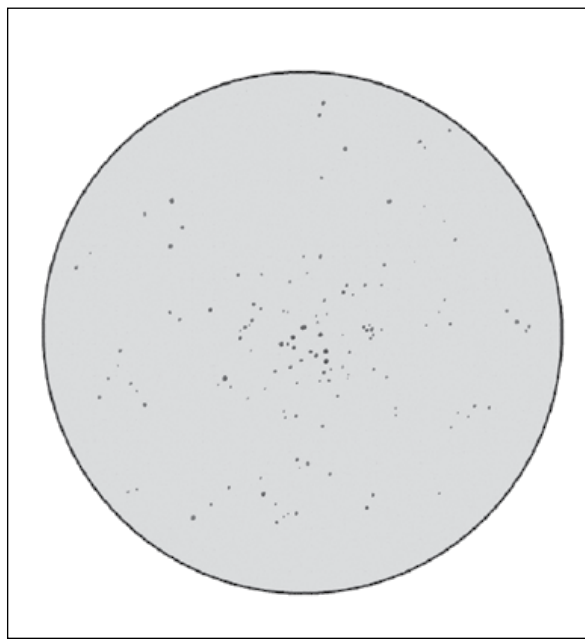


Caroline Lucretia Herschel – Pencil Sketch:
Kathryn van Schalkwyk

One October month around midnight when the Moon was new, I walked out under an exceptionally dark and transparent sky filled with starlight. I gazed up and was amazed to see a very transparent, large round-ish glow between the constellations Aquarius and Pisces. This very rare sight later turned out to be the gegenschein or counter-glow of the sun, which is a point opposite the sun that shines its light slightly brighter against the background starfield. It results when dust particles orbiting the sun scatter its light back towards the earth. I decided to dedicate this particular special night to a woman called Caroline Lucretia Herschel and the objects she discovered.

Caroline Herschel was born on 16 March 1750 in Hanover, Germany and died in Germany on 9 January 1848. Her unselfishness and assistance enabled her brother William and his son John to leave a rich heritage to the astronomical world. Her brother William equipped her with a telescope and encouraged her to hunt for comets. With great perseverance over time and sometimes icy cold nights, she discovered eight comets and a handful of deep sky objects.

With the Ophiuchus constellation already descending in the west, the first object I sought out was the open cluster **NGC 6633**, already discovered by Jean-Philippe de Chéseaux about 1745. My first impression was a bright group of stars of various magnitudes. The centre exhibited brighter stars in an uneven semi-circle, mingling with fainter members. A faint string of stars on the north-east edge of the group draped from north to south. A very tight knot of six stars can be seen towards the western edge of the cluster.



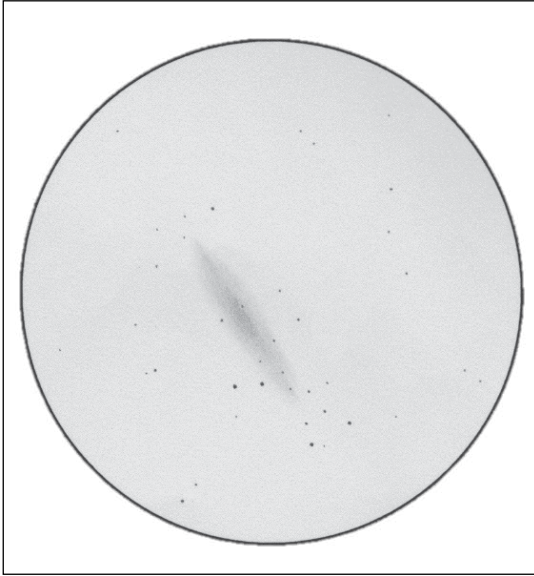
NGC 6633 – Open Cluster

From my southern hemisphere location, the stars of queen Cassiopeia's crown can be seen low on the northern horizon where they only bow for a short period of time. **NGC 7789**, displays a swarm of faint splinter stars, slightly elongated in a north-east to south-west direction, and somewhat condensed towards the western side. On the far north-east edge of the cluster is a prominent short string that merges with the busy starfield. The object is situated 2.8 degrees south of magnitude 2.2 beta Cassiopeiae. I paused a moment, feeling relatively warm with my jacket and beanie, and wondered whether Caroline, like me, would also have worn three pairs of socks, one over the other.

NGC 225 offered me just a few stars visible through the branches of the trees. However, various photographs have shown an uneven triangular group of stars pointing south, with a slightly brighter S-shaped string of stars in a north-south direction just east of the cluster.

Surprisingly, **NGC 659** revealed a hazy patch together with a few brighter field stars towards its southern end. Not much of an observation but it was my best try, especially considering it had been the most northerly object seen so far from my southern position.

The open cluster **NGC 7380** situated in the southern part of the constellation Cepheus, displays a few bright stars combined with fainter members embedded in nebulosity. A dainty string of faint stars flows quite clearly across the cluster in a north-south direction. A prominent double star can be seen on the western periphery of the group.



NGC 253 – Galaxy

At its highest point in the sky at this time of year is Caroline's most famous object, and a blessed southern delight. **NGC 253** also known as Bennett 4 is a showpiece galaxy in the constellation Sculptor. The galaxy was discovered by Caroline on 23 September 1783 with her 4.2-inch reflector. NGC 253 is bright and almost edge-on, oriented in a north-east to south-west direction, with a slightly brighter oval nucleus. The surface displays an uneven structure with dark knots and a few stars embedded within it.

The outer edge of the galaxy seems flimsy and woolly, and I could almost see it hanging three-dimensionally in the dark of night. Auke Slotegraaf observed NGC 253, also known as the Silver Coin Galaxy, with 11x80 binoculars, which showed a very elongated galaxy, wedged between stars. He once advised me to describe an object so as to reflect the beauty and detail that my eyes were relaying to my mind.



NGC 253 – Galaxy – Photograph: Dale Liebenberg

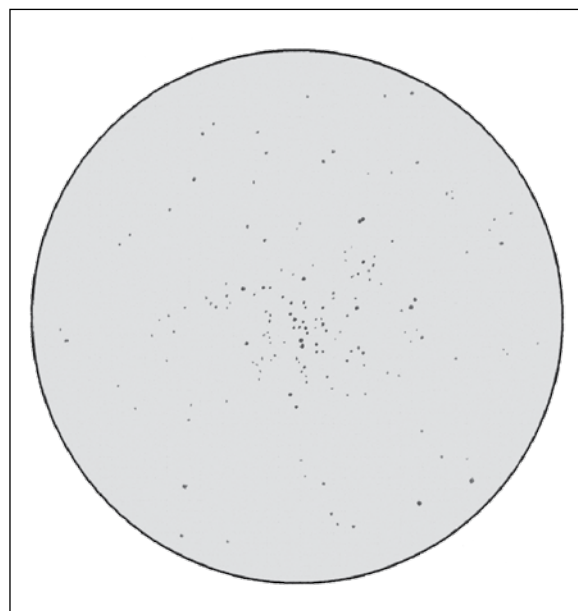
Independently discovered by Caroline and Charles Messier, is **NGC 205**, also known as Messier 110 and the north-west companion galaxy of NGC 224, the Great Galaxy in the constellation Andromeda. NGC 205 displays a soft oval covered in haziness with a rather bright nucleus. Caroline was surely bathed in joy when she stumbled across such a lovely object. Messier, a renown comet hunter had, however, already laid eyes on this object 10 years earlier.



NGC 205 – M110 – Photograph: APOD-NASA Schedler

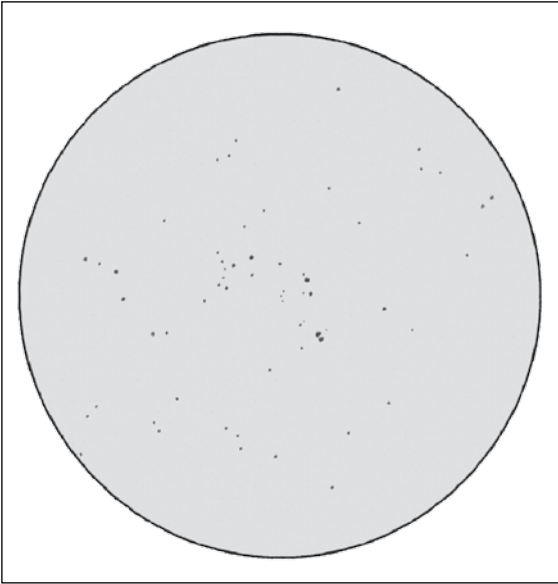
Perhaps if fate had assisted Charles Messier and Caroline Herschel, they could have had a marriage made in heaven under the starry sky filled with deep sky objects and, of course, comets. Caroline discovered her first comet during 1786 in the constellation Leo; the first woman ever to have found one.

Before my thoughts get out of hand, let's continue to **NGC 2548** also known as Messier 48 in the constellation Hydra. Again, Caroline and Messier independently laid eyes on this large, bright and loosely clustered group of stars displaying circles, pairs and triplets. An uneven string of stars runs through the cluster in a north-south direction.

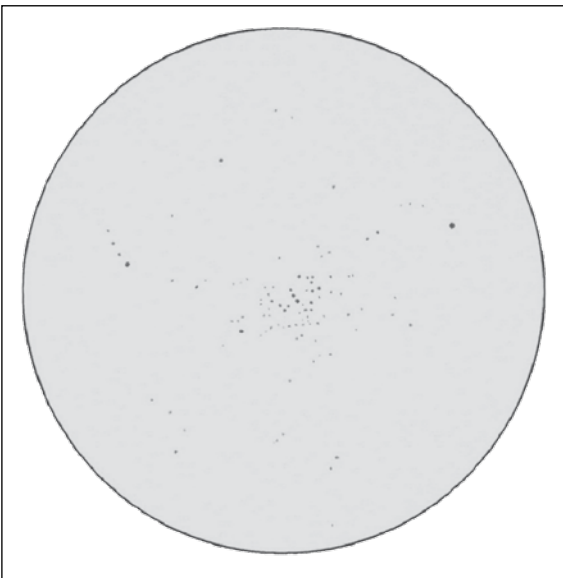


NGC 2548 – Open Cluster

Did Caroline ever stare into the night sky, many, many years ago and, like me, wish to discuss and share it with someone? To be at the telescope all by your-self is a very lonely pursuit. With a frozen nose, shivering hands and chilly feet, I comforted myself with the thought that winter in England is usually very much colder than down South.



NGC 2349 – Mystery Object



NGC 2360 – Open Cluster

There is also a mystery object in the constellation Monoceros, which remains an intriguing puzzle to this very day. On 24 February 1786, **NGC 2349** was seen by William as a cluster of sorts at the indicated position, whereas John Herschel gave its position as that of a double star. I, in turn, picked up a few scattered faint stars a few arc-minutes to the north-east of the indicated double star position, which stand out but could be part of the busy starfield.

NGC 2360, also known as Caroline's Cluster, is just 3 degrees east of the magnitude 4 gamma Canis Majoris. This lovely grouping is a scattering of faint stars in short and long strings, which are tightly grouped together. The cluster core is well concentrated and stands out clearly. The blue magnitude 8.9 mu Canis Majoris edges the cluster's eastern side. This special group is about 1.3 billion years old, which is unusually old for an open cluster. The object, her first discovered one, must have made Caroline proud of her discovery.

Following this historical journey of seeking out Caroline's objects was indeed nostalgic and of course a great privilege. What a remarkable woman for her time!

OBJECT	CAROLINE HERSCHEL	TYPE	RA	DEC	MAG	SIZE
NGC 205 Messier 110	H V.18 Andromeda	Galaxy	00h40m.4	+41°41'.0	8.1	19'×12'
NGC 225	H VIII.78 Cassiopeia	Open Cluster	00h43m.4	+61°47'.0	7	12'
NGC 253	H V.I Sculptor	Galaxy	00h47m.6	-25°17'.2	7.6	30'×7'
NGC 659	H VIII.65 Cassiopeia	Open Cluster	01h44m.2	+60°42'.0	7.9	5'
NGC 2349	H VIII.27 Monoceros	Mystery Object	07h10m.8	-08°35'.6	12.3	**
NGC 2360	H VII.12 Canis Major	Open Cluster	07h17m.8	-15°37'.7	7.2	12'
NGC 2548 Messier 48	H VI.22 Hydra	Open Cluster	08h13m.8	-05°48'.0	5.8	54'
NGC 6633	H VIII.72 Ophiuchus	Open Cluster	18h27m.7	+06°34'.1	4.6	27'
NGC 7380	H VIII.77 Cepheus	Open Cluster	22h47m.3	+58°06'.0	7.2	20'
NGC 7789	H VI.30 Cassiopeia	Open Cluster	23h57m.3	+56°44'.0	6.7	15'

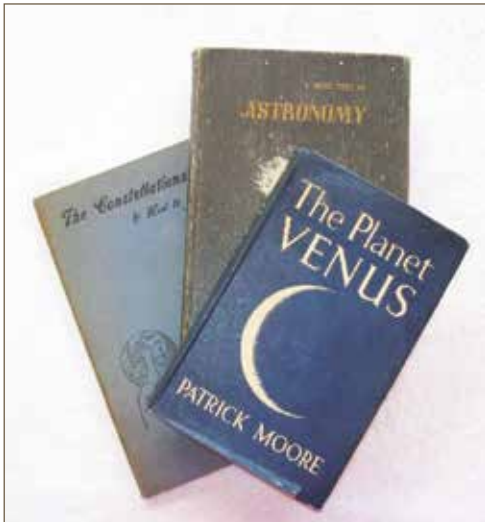


NGC 2548 – M48 – Photograph: Dale Liebenberg

Old Astronomy Books

Astronomy books dating back many years occupy a place of honour on my bookshelf, because they produce nostalgia and wonderment. Browsing through them is also a way of taking me back to the days of ancient astronomy.

Nowadays new technologies are taking over with a vengeance, and in this world, books on astronomy, which can still fulfil a function in several respects, battle for a place in society.



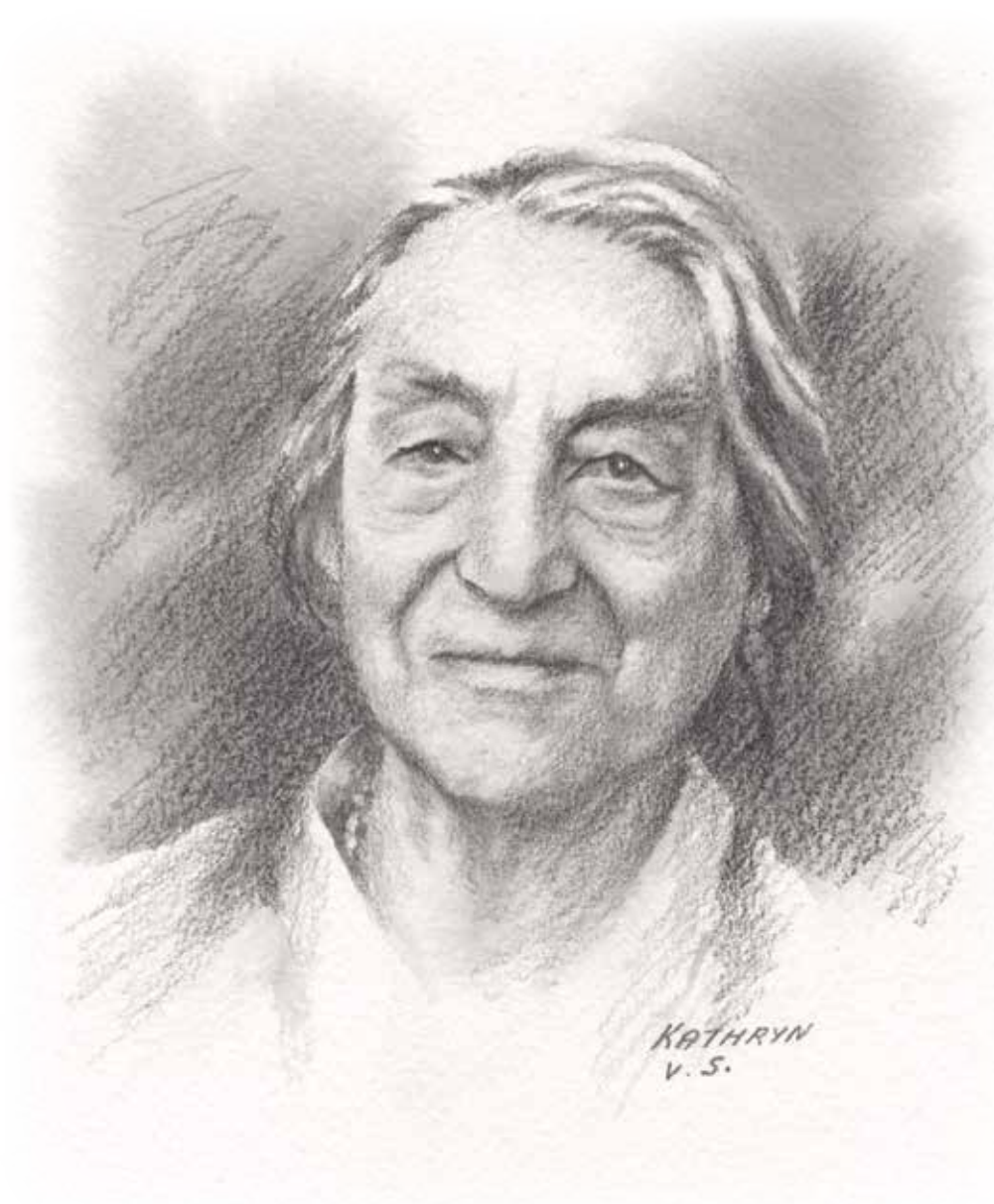
To be able to page through a character-filled book of long ago is to look back into the past. Not only can the views of ancient astronomers be shared, but also their questions, their amazement and their attempts to understand. What could produce more nostalgia than feeling the pages between one's fingers, and the unique wood smells of old books. Time marches on and I try anxiously to establish a connection with older astronomers who made their mark, as these old written documents show.

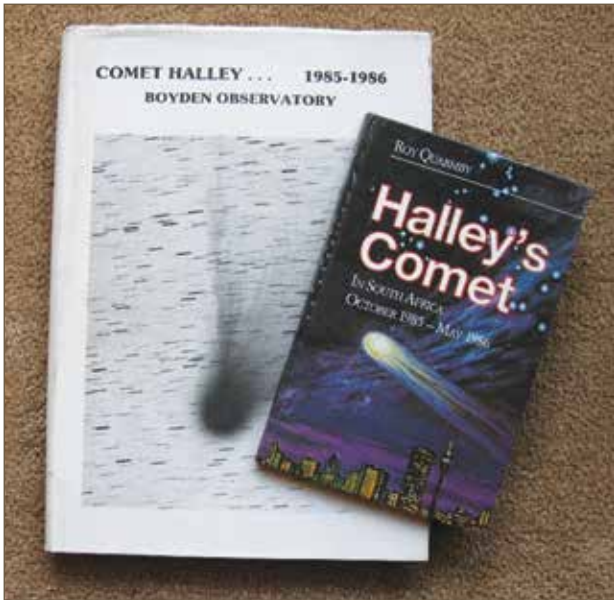


The thickest and oldest book on my shelf was given to me by the late Mary FitzGerald. Simply titled *The Moon* – Neison. It is bound in a rich red leather cover and was printed by Spottiswood and Co. in 1876. The book covers the general nature, movements and condition of the Moon. It contains the most beautiful hand sketches of the Moon's cratered surface. Inside the book I found a faded yellow one-leafed British Astronomical Association Circular of 1926.

A really romantic astronomy book (yes, they do exist!) is most definitely *The Magic of the Stars* – Maurice Maeterlinck. The little green leather book with embossed gold letters was published in 1930. The late Dr Neil Williams gave me this book full of treasures that dwells at times on the immensity of the universe. Using 2-inch and 3-inch apogee telescopes, Williams was a keen observer during the Moon Watch programme from 1957 to 1958. The book *The Magic of the Stars* was one of his precious books and according to him occupied a very special place in his heart. Well, I was fortunate to receive it as a gift from him at the beginning of 2006.

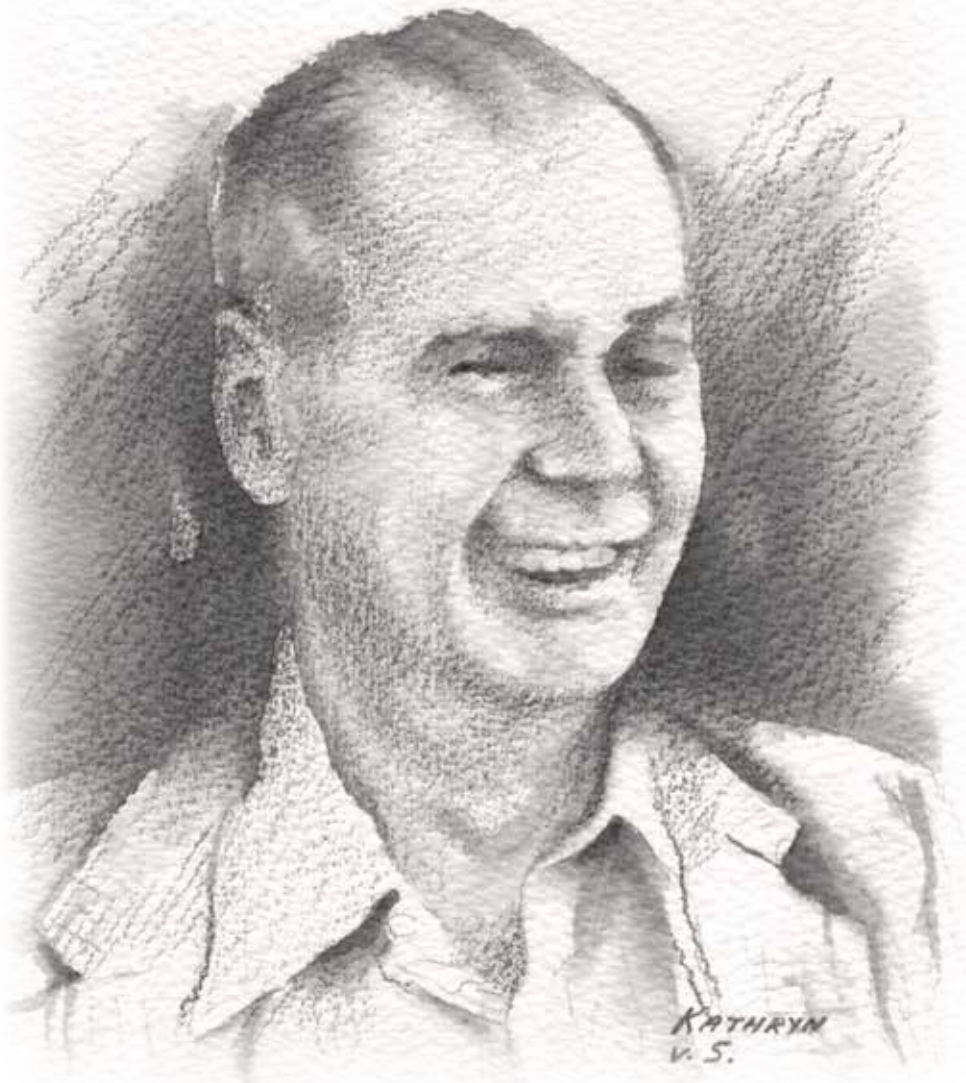
I wrote a short letter to Ellen Dorrit Hoffleit, a then American senior research astronomer at Yale University, to share with her my humble way of studying the universe through my ordinary telescope. Later, I was extremely surprised to receive a parcel in the post from her. Between the sheets of thin paper was her book *Misfortunes as Blessings in Disguise*, the story of her life. In her letter she encouraged me to keep looking at the wonderful southern skies. When Hoffleit died on 9 April 2007 she had just turned 100, having been born on 12 March 1907. She discovered the optical variability of the quasar 3C 273.



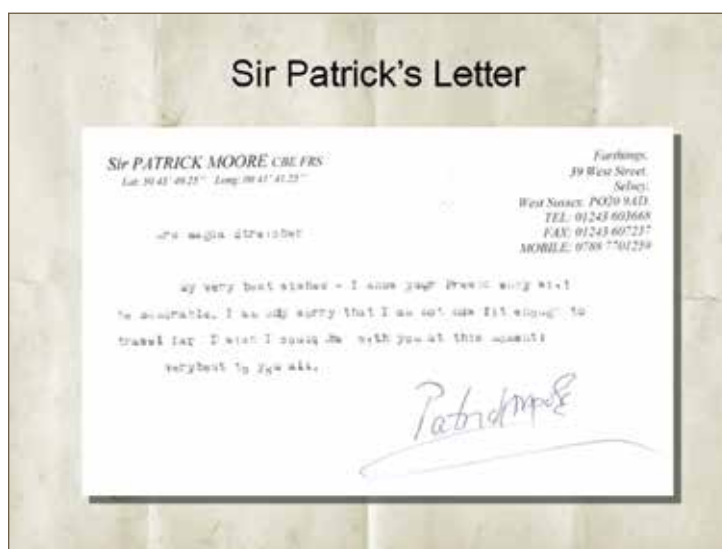


Also, quite prominent on my bookshelf is the book *Comet Halley*, by A.H. Jarrett and G.J. Malcolm published Boyden Observatory in 1986. The late Michiel Danie Overbeek was my motivation and inspiration for many years and it was truly a privilege to have known him. It was his wish that this book should come to me after his passing. Danie served twice as President of the Astronomical Society of South Africa and was Director of the Occultation Section for many years. He made over 250 000 variable star observations. The Minor Planet Centre in the USA

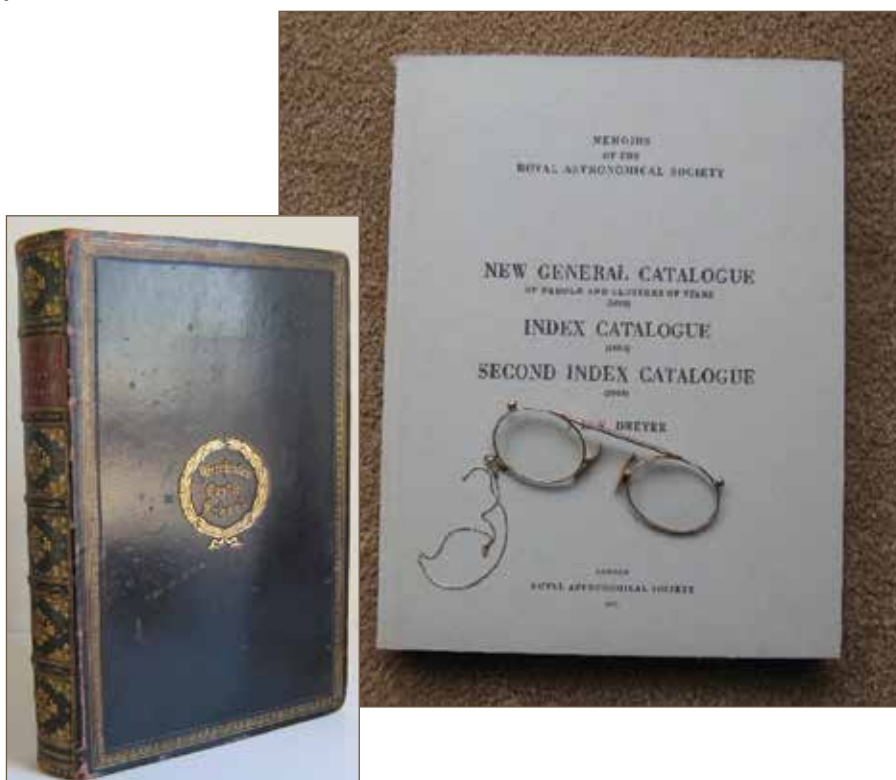
announced on 11 November 2000 that minor planet (5038) Overbeek = 1948 KF be named in his honour. Some of Danie's last written words were most appropriate: "I shall now bow out gracefully."



I sent a hand-written letter to Sir Patrick Moore and received back the stately white envelope with Sir Patrick's embossed initials on the back. This man, who is rumoured to be better known in Britain than the Queen (not really!) sent me a note typed on his old 1923 typewriter. He had made his mark over the previous 60 years promoting astronomy through his famous Sky at Night broadcasts on BBC television and through the dozens of books he has written. He died on 9 December 2012.



Interesting, the oldest book in the SAAO Library is a copy of the first printed edition of the Almagest of Claudius Ptolemy publication dated 1515. It has obviously seen some rough treatment over the centuries and is believed that Dr Robert Thorburn Ayton Innes most probably purchased the volume with Observatory funds.



I have given my old books a special place in my study, to look at them and ponder the old astronomers who wrote many famous and insightful lines as they opened their souls to explore and share their thoughts of long ago.

When it is cloudy or rainy outside these books keep me close to the stars.

The Bushveld

The northern part of South Africa is known as the bushveld with a different, and a highly distinctive character. People generally believe that the area situated to the north of the Soutpansberg reflects the harsher character of the bush, but there is another perspective that is closer to the truth.

This part of South Africa, just diagonally to the north of the Tropic of Capricornus, consists of hard earth, adorned with stones and indigenous trees. When looking out across the summer fields, one sees its green vegetative carpet and thorn trees stretching into the distance. In colloquial language, we would say that the bush teems with life. In arguably a year of most beautiful and wettest summers it is indeed a grateful world. Field grasses have risen from their roots, concealing that famous stony ground in a way that they have not done for a long time. Butterflies and moths dance across the masses of grassy seeds and wild flowers, bringing with them a birds' paradise of colour and song. The impala performs their mating dances right through the night, and the frogs' sing their endless song of love at the dam nearby. The hot, oppressive summer temperatures are kept bearable by a refreshing easterly breeze.

Early evening in the Bushveld is peaceful, beautiful, indescribable, and unique, with long shadows and colors stretching over the landscape. Time is relative and the charm of the bushveld becomes enveloped in darkness. A spectacular display of stars appears, doubling in numbers every minute to adorn the African canopy. It is indescribably delicate and beautiful, and holds the eye captive without letting go.



The bushveld in splendid glory after the first summer rain



Daughter Ursula is dwarfed by a relatively young Baobab tree,
typical in the northern part of South Africa

There is no more to say when there is a change to move into position behind my telescope to explore in amazement once again one deep sky object after another in all its splendor. The bushveld with its dark transparent night sky is an integral part of my life, and together we form a tight unit beneath the depths of the universe.

A Memorable visit to La Palma

Always striving for new challenges and fulfillment, a passion for the starry skies, stirred this amateur into reaching further into the depths of the universe. Being familiar with the southern skies that are packed with jewels of the night, I decided to opt for a search of Polaris and its surrounding companions. Those who do not dare, cannot win, I reminded myself as I started investigating the possibilities of a visit to the Spanish Observatory in La Palma. My joy at the friendly confirmation of this visit was immense!



The dangerous runway of La Palma airport, which is directly adjacent to the sea, could engender no fear in me; my thoughts were focused on the Isaac Newton Telescopes on the beautiful island. I traveled slowly up the winding road of the volcanic mountain, which rises sharply from the ocean framed by large fields of wild flowers and dense bush. The jagged rocks in the distance and the apparent desolation unfolded gradually to reveal incredibly blue skies beyond the white cloud mass. At a height of 2426 metres above sea-level, the view was truly exceptional and the cluster of observatories, perched on the edge of the crater, a definite highlight.



From descriptions, Las Palmas probably sounds like a group of sentinels on the edge of a volcano, but it is, in fact, situated more towards the east slightly inland. At the southern end lies the volcano Cumbre Vieja whose western flanks may someday collapse into the Atlantic triggering a mega-tsunami. For a moment, I tried to put the fiery thoughts to rest.



I stared at the amazing white round domed structures, realizing that this is probably a once-in-a-lifetime privilege to be nurtured forever. Rene, the friendly engineer in charge of the telescopes, explained the operation of the enormous space-guards to me. The control rooms are equipped with the very latest technology and the telescopes are electronically controlled.

The Isaac Newton group, together with various others like the 3.6-metre Galileo, 2.5-metre Norwegian, 60cm Swedish telescopes, as well as the Germany Sun and Gamma projects are situated at North +28. With up to 90% clear skies per year, the *Observatorio del Roque de los Muchachos* is regarded as one of the best astronomical destinations in the world.

The stately Isaac Newton Telescope originally came from England in May 1984 and has a new 2.5-metre mirror and upgraded instruments. The telescope is used mainly for wide field spectra observations. Isaac Newton was born in Woolsthorpe, England on 25 December 1642 and died in March 1727. His success story is well-known in science and optic works.



The white glazed Jacobus Kapteyn Telescope, with its 1-metre mirror, is used to study the brighter objects. Jacobus Kapteyn was born in the Netherlands on 19 January 1851. After obtaining a doctoral degree at the young age of 27, he was appointed as Professor in Astronomy at Groningen in the Netherlands. He served in this position until he turned 70. During his lifetime, Kapteyn recorded about half a million stars.

At the time a few years ago, the William Herschel Telescope with a mirror of 4.2-metre in diameter was the largest telescope in Western Europe. The telescope is housed in a round domed structure of 22 x 30 metres and first saw the light in August 1987. Sir Friedrich Wilhelm Herschel was born in Hanover on 15 November 1738. Initially, a successful musician, he turned to astronomy with the discovery of the planet Uranus in 1781.

What an awe-inspiring moment when Rene opened the 4.2-metre Herschel Telescope and lowered it to enable me to have a closer look! A crystal-clear search discovers space for the known, yet unknown. A wonderful feeling of being at home with total satisfaction washed over me, what more can anyone ask for? The William Herschel Telescope is already fulfilling its promise of elucidating the structure of the universe, as did the great William Herschel himself.



Imagine my jubilation when I learnt that the astronomer on duty would allow me to be present at the observations which were to take place on the night of 24 May with the Herschel telescope! Astronomers, like Max Pettini, study young galaxies of magnitude 25 and higher to find what they might have looked like during the formation process, whilst the most in-depth observations are done with the William Herschel and Isaac Newton Telescopes. Ingrid the CCD red-projected equipment shot photographs in different red-band spectra during a duration of 10 minutes to indicate the thousands of galaxies which just reflect like minute specks of light. According to Pettini this target area is similar to certain quasars, dense distributions of galaxies and approximately three-quarters of the way towards the outer red glow, galaxies that are situated approximately 12 billion light-years to the exterior. Being one of the world's top astronomers he was interested in learning more about my contributions and studies of astronomy in South Africa and to my delight asked numerous questions.



I had a cup of coffee in the early morning hours and left with the wishes for a good night's rest from the day-shift team coming on duty. The friendliness once again underlined the fact that astronomers support each other on many levels, even if it is only Magda who passionately explores the skies with an ordinary telescope. The time sped past like a light-year, although fresh and new that would last a lifetime.

The Stars Above

The Milky Way ore my head does flow,
That starry stream scant movement show,
 Its path from north to south,
Through myriads of other systems go,
With twists and turns, no banks overflow,
 Eddies and rapids are there none.
Its path through the heavens, a circle makes,
No source, no end, just a continual flow,
 The stars in the sky are like our sun,
 All clustered in great nebulae,
To count them all is an impossible task,
 Each system has its millions of suns.
Around each core its own planets run,
When our moon does rise, it's an ebbing tide,
 The starry stream fading in the sky,
Stars go dim as the moon shines down,
 But in the dark, with no moon on high,
Our heavenly river is in space, and is flowing strong,
 The Earth, our home, is in this galaxy,
 A grain of sand in the Milky Way.

John Maynier



Goodbye Mary

In Astronomy it is more or less the norm to be motivated and inspired by someone else who is familiar with the field and, most of all, creates within you a love for the starry skies. Such a person was Mary FitzGerald, and such an example to me. Every step I took in my attempt to observe as a youngster – how to observe, how to make valuable astronomical notes – was a learning experience with her as my mentor. She was well educated, and extremely well versed in her discipline. Together with other astronomy friends, we spent time under the stars, drinking in the beauty of starry deep sky objects, describing them to their full capacity to try and capture their glory in pictures, sketches and words. She would motivate and praise, and most of all she was so proud of others' achievements. Mary was a lecturer at the University of the Witwatersrand Planetarium in Johannesburg for many years.



She describes her stay with me on the farm: "Dinner time came around, and we enjoyed a lovely crispy barbeque chicken in the weber braai with baked potatoes and real traditional African doek pudding with cream.

Facing the telescopes, we used to take a deep-sky tour from one deep sky object to another until the wee hours of the morning when the sun started brightening the sky once again. The starry night skies are indeed a wonderful reality, snuggling in the mysterious universe with its splendid deep-sky objects. Sharing a few of her thoughts in her own words, quoted below, would probably best help reflect the way she thought about, and adored, our beautiful night skies:

"The Milky Way on the eastern horizon is the time of year which I adore our place in our home spiral galaxy. Why, because Crux shows the kink to the west indicating the arm which cuddles our neighbours and home star.

NGC 3581 located in Carina is an obvious large divided fan-shaped nebula, with a dark band running from south-east to north-west. Two stars appear as two human eyes to the south of the nebula staring down to our humans on earth, resembling a mask which could be used at a masked ball.

Omega Centauri, in the constellation Centaurus, resembles a pot filled with white sugar! Impressive, extremely large and overwhelmingly rich mass of stars to please the eyes of a woman getting older by the day".

Mary FitzGerald passed away in the late afternoon of 29 June 2014, and her ashes were scattered in the sea at Hermanus.

Pulkovo Observatory



Never did I ever think that an opportunity to visit the Pulkovo Observatory would cross my path, but it did. In my thoughts were these visions of the great astronomers and old telescopes of long ago. Those observers of the night skies had walked through these black iron gates, and the road ahead, framed with rich forest plants and trees many years ago. Up ahead a building, once a hotel (clearly not one any more) for visiting astronomers is now just a silent memory. My heart sinks, as there is no one around, although I was not mistaken: the sign clearly indicated that this was the Pulkovo Observatory outside the city St. Petersburg in Russia!

So, I keep following the road, hopeful and believing. Suddenly the stately building with the dome on the top shows the way. In summer, during the warmer weather, maintaining buildings is the norm and Pulkovo is no exception. It is also a popular time for astronomers to take their annual

leave. Most of the observatories were closed and could not be entered. I went to great lengths to secure an appointment with one of the astronomers to visit the observatory at this time.

At the entrance to the main building with its large wooden doors, once the pathway of famous astronomers, a friendly young man offers to show me the museum. He turns out to be an astronomer and lecturer working at Pulkovo. It feels like walking back into history, and the large hand paintings of astronomers who had opened up the universe in so many different ways bring a humble feeling. Old newspapers, scrips and teases been housed in wooden boxes, valuable refractors dating back to 1703 in glass showcases. Amazing to me was the old observing chair, the sextants behind glass and sputnik that had circled the earth once.

The highlight for me was the stately hand-painted picture of the astronomer Friedrich Georg Wilhelm Struve (1793–1864). In 1815 he married Emilie Wall (1796–1834) in Altona, who bore 12 children, only eight of whom survived early childhood. After his first wife died, he got remarried, to Johanna Henriette Francisca Bartels (1807–1867), a daughter of the mathematician Martin Bartels. She bore him six more children.

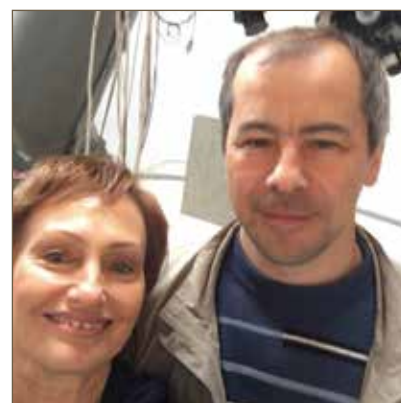
The old observatory in the town of Tartu, which is now the second largest town in Estonia, was the place where this famous astronomer Struve once worked as the director of the institute in 1818. He used the 9-inch Fraunhofer refractor, which at the time (1824-1854) was the largest telescope in the world and the first telescope to be clock-driven. He also supervised the measurement of the Russo-Scandinavian arc of meridian, stretching the line from the Black Sea to the Arctic Ocean. The asteroid 768 Struveana was named after him. He discovered a very large number of double stars and in 1827 published his double-star, *Catalogus Novus Stellarum Duplicium*.



In 1830, Czar Nicholas I, set aside land in the Pulkovo Hills outside St. Petersburg, Russia, as the site for a new astronomical observatory and selected Struve for the commission responsible for its construction. When the Pulkovo Observatory opened in 1839, it could boast not only of Struve's being its first director but also of housing a telescope with a 15-inch (76-cm) refractor objective lens. It was the best-equipped observatory in Europe. At Pulkovo Observatory, Struve continued observing binary stars and moved into the areas of practical astronomy and geodesy. The observatory's staff also made numerous measurements of geographic points in Russia to supply information necessary for road building, railways, and military needs, and in 1845 Struve helped to establish the Russian Geographical Society.

It was in 1835 that Struve started with efforts to measure the parallax of the star Vega (alpha Lyrae), a star he had selected for its brightness and large proper motion, which suggested that it might be near earth. After his death on 23 November 1864 his son, Otto Wilhelm Struve, continued the Struve dynasty in Russian astronomy. Otto Wilhelm Struve's directorship of Pulkovo Observatory began in 1858 and lasted until 1899.

Maxim Khovritchev, who is working on double stars, offered to show me his refractor telescope housed in a dome about 200 metres from the main building. Although still equipped with an old wooden dome, all is in perfect working order. The telescope is still equipped with the original box used to take glass plate pictures, but now obviously makes use of a CCD camera sensor.





Then Maxim had to leave! My heart sinks a second time, but I feel sure I will be provided with another guide. The Russian receptionist explained to me in perfect Russian (or it could have been any language I didn't understand) that she would try to find someone else to act as my guide. After a while the door opened and in walked a lady who would show me the observatory grounds, which house quite a few domes. Her name I could not pronounce and now cannot remember, but she told me of her willingness (while also using hand gestures) to explain things to me even though her English was terribly poor. She was my only option, however, and off we went to the upper roof of the main building housing the large observatory where Struve had worked

and achieved great success. The wooden steps leading to the observatory were once Struve's walkway, and the black iron railing had been touched by many hands of the famous. The observatory door was closed, but at least the views overlooking the observatory grounds were spectacular. That should and would have been my highlight if only I had been able to see the inside of the observatory where Struve would have spent night after night observing. An observatory has a way of affording one a glimpse into the observer's heart and soul. In that way I would have been able feel his presence, smell his books, walk in his footsteps ...



What I learned is that most of the astronomers and their families had lived on the grounds and had all been buried in the cemetery situated not far from the main building. My visit to Pulkovo was running out, so I grabbed my guide by the hand and indicated that I wanted to go to the cemetery to see Struve's grave. I stood in amazement – it is a cemetery with a difference: tranquil and peaceful. In among thick scrubs with a forest feeling is a multitude of old graves, some covered with moist moss. The graves bear not only the names of astronomers but also information about what they were famous for, along with a picture of the person.

The lady's anguished look told me she could not remember or find Friedrich Georg Wilhelm Struve's grave, as she threw up her hands in the air! And there was no way I could help her, as each grave told its story beautifully only in Russian! She pointed to an area indicating that it must be somewhere there! Struve had died in 1864 and one of the stones nearby covered in moss was indeed his. One of my pictures (somewhat out of focus to the right) captured an image of Struve's grave with a wooden cross, which I discovered only afterwards. The white stone to the right of his grave indicates the grave of Johanna Henriette Francisca Bartels.



I leave Pulkova Observatory with a feeling of unfulfillment but a visit I will never forget.



Photograph: Mornja Ctpybe



Friedrich Georg Wilhelm Struve
(1793-1864)
Pencil Sketch
Kathryn van Schalkwyk

A Journey into the Cold

Some events in life remain with you forever, while others disappear with time. What is beyond doubt, is that a visit to the extraordinary country of Iceland would be difficult to replace and impossible to forget – the memories would never fade.

“Excited” would be understating how I felt at the prospect of visiting that multifaceted country. Knowing that we could expect icy cold weather I packed everything that would effectively protect me against the cold – or so I thought! But freezing aside, there was a huge excitement in me and full confidence that I would get to see the Aurora Borealis (northern lights). This natural wonder, seen against a dark night sky, must surely be the purest and cleanest form of miraging, dancing with paint strokes of bright colours. The best and rarest phenomena in the night skies are not always freely available and frequently observable – think of solar eclipses and the Aurora Borealis or Aurora Australis as examples.



I have never been so cold in my life, but the great expectation somehow served to calm that cold and make it more bearable. Iceland was in the throes of winter, and the extensive white landscape was covered with snow and ice. The bus offered wonderful warmth – until we had to alight at the Grabok Crater. The beauty was overwhelming, and the sight of the flowing lava far exceeded our expectations. In the distance a majestic crater could be seen which was dormant at the time, but which, as we were told, was capable of a mighty eruption at any time. Iceland has the greatest number of volcanoes, waterfalls, glaciers and geysers on the earth’s crust because of its particular location.

The impressive Atjaflatjeyoka glacier, the largest of its kind in Europe, forces its frozen way through mountain peaks to pit itself against the earth’s forces.



One of the most beautiful, waterfalls, however is the Hraunfossar, which consists of a series of falls dropping over a lava ridge. Light snow was falling while we were there, and it was a fairy tale scene that etched itself into this South African lady's memory. Some parts of the waterfall are frozen. The light snow drifted down on to the plants, and the white snowflakes forming a thin veil in front of my face produced unspoilt beauty. Lava fields from which steam escapes, tell the story of smouldering hot activity below the crust of the earth.

Possibly one of the most impressive parts of Iceland is the Haukadalur area with its lava fields, where steam bubbles from the earth's crust. The active geysers, whirlpools of boiling water, reach maximum pressure and then almost literally explode, shooting their steam many metres up into the air. It makes for a sense of vulnerability to realise that below the surface there is this constant boiling and churning of lava, hot water and steam, all accompanied by a strong smell of sulphur.

Iceland obtained their independence from Denmark, their spoken and written language is surely one of the most complex found in any country, and almost impossible for foreigners to pronounce and write.

This clean, unspoilt, developing country makes use of the natural volcanic activity to supply hot water and power to every home through its power stations. Summer produces a magical green landscape as a result of the rich volcanic soil, and then provision is made for animal fodder to be stored for the long winter. Fruit and vegetables are cultivated successfully in tunnels with the aid of new technology.



Probably the best-known of the many volcanoes in Iceland is Hatla, which in 2010 showed what the seething magma of molten rock deep in the earth is capable of in terms of blasting its way up into the sky. Our excellent Icelandic tour guide had many stories to share about survival in and adaptation to the conditions of this multifaceted, wonderful country.



The Vatnajökull Park is the largest in Europe at about 12 000 square kilometres. However, the Skaftafell National Park is where the true beauty of Iceland can be seen, with the Jökulsàrlòn glacier with its floating icebergs and black sandy beach, aptly named the Diamond Beach with its beautiful ice fragments appearing like glistening jewels on the black velvety sand.

Icy crystals sparkle in the sun like diamonds, and in the distance the snow resembles whipped cream topped with grated dark chocolate for miles on end. The beauty and splendour of the lagoon are indescribable. These unforgettable, captivating impressions and thoughts are further heightened by warm bread, Icelandic butter, geothermally boiled eggs, herring and geyser schnapps for the cold.



We journeyed through hot springs terrain (at 97° Celsius), travelled through snow storms, pondering the unique country and exceptional countryside. Every evening we braved the cold, below-freezing night air in search of the elusive Aurora Borealis. But the weather remained overcast and we learned that this has been one of the coldest weeks yet during Iceland's winter this year. But finally, on our second to last night in Iceland, the bright starlight broke through and the Aurora Borealis appeared as a bright green band against the dark night sky. Stars shone through the flimsy veil stretching from north to east in a graceful band. Here and there a hazy kink appeared and it looked as though the blowing steam was playing a concertina, shimmering and dancing, almost ebbing and flowing in glowing, graceful red and purple lines painting the sky.

The enchanting, incredible, white snowy landscape is infinite, the beauty overwhelming. The crackling of crispy snow and ice underfoot added to this once-in-a-lifetime experience which will forever remain etched in my memory.



A Meeting to Remember

What a great honour to share the day in Cambridge, the United Kingdom, and be a speaker at the Webb Society AGM function. As is customary, it would be held in June at the faculty of Astronomy and Science at Cambridge University. As a member of the Webb Society in England for the past 15 years I contribute to their journals and became friends with the members. On top of that I heard that the members were looking forward to this southern speaker who was going to share with them the wonders of the southern deep sky. Well, not being that fluent in the British tongue, I dared myself to strength with my winning smile.

On the agenda was also a stop at Greenwich Observatory to meet the time. I was fortunate to be accompanied by my daughter Belinda and Andra to make sure I would be okay all the way. Of course, it was also beneficial for them to have me looking after their needs!

The English always speak about their lovely summer, but oh dear, I literally shivered and shook from the cold – or was it because I was due to appear as a guest speaker in a lecture theatre in one of the world's best Universities and on top it full of people?

Cambridge is a beautiful student city with a rich history and stately old buildings. On the square there is a distinctive golden Corpus clock that was built in the early 1800s. It comprises circles indicating hours, minutes and seconds. Particularly striking for me was a dragon-like creature on top of the clock that pulls the second hand down with its foot.



The Corpus Clock



One of Cambridge University buildings

The reception was wonderful and conversations flowed. I had to dig into the depths of my memory to produce my best English as I shared my programme of telescope work and observation with much enjoyment and in great style. Anyway, I was well prepared and spent much of my time talking about the Magellanic Clouds and nebulae discovered by Karl Henze, how to select the areas and create valuable observations. I used sketches of the areas as well as the beautiful photographs Dale Liebenberg had made available to me as illustration material. Something I realised afterwards was what an attraction the sketches had been and how many questions had been asked based on them.

The other four speakers were very well-known personalities: Wolfgang Steinicke, who spoke about John Herschel's observations when Herschel visited the Cape of Good Hope. Dr. Andrew Crumey from the University of Northumbria, who spoke on modelling the visibility of deep-sky objects. Olivier Thizy, introduction to astronomical spectroscopy. The main speaker Dr. Mike Irwin, head of the Cambridge Astronomical Survey Unit, shared with us M31 and its Environs. The society's president, Bob Argyle, spoke about the legacy of Kenneth Glyn Jones before closing the meeting.



The speakers at the conference:
(L-r) Dr. Andrew Crumey, Dr. Mike Irwin, Dr. Wolfgang Steinicke,
Magda Streicher, Bob Argyle and Olivier Thizy

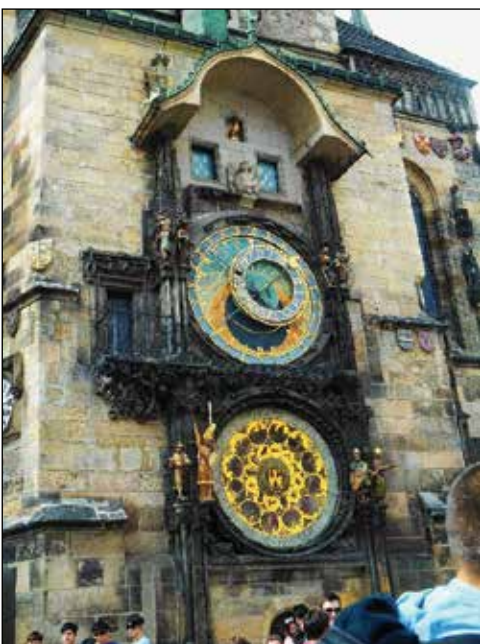


The grounds of the Observatories house the famous Northumberland Equatorial Telescope, the only remaining large instrument, from as early as 1838.

The Duke of Northumberland had indicated his wish to donate a large telescope and was encouraged to do so by the director, G.B. Airy. The lens was an achromatic doublet of 11.6 inches with a focal length of 19 ft 6 inches, made in Paris, France. Bob Argyle proudly showed us the Thorowgood Telescope 1864, which is his work instrument for his most valued work on double stars.

The evening ended with the speakers and members being treated English style and me getting the opportunity to learn much more about various aspects of astronomy. It had been a wonderfully busy day, and a happy one, and I had been far more at ease than I had thought I would be. What made my day was when I was told, "You were the star today."

One of the oldest cities is Prague, which dates back to about the 9th century. The historical Prague astronomical clock is special, I must admit. The clock was



created by Mikulas in 1410 and perfected by the master Hanus in 1490. In 1864 Josef Manes created the astronomical clock and calendar panel, not for the exact time but to imitate the supposed orbits of the sun and moon about the earth. It shows the movement of the sun and moon through the 12 signs of the zodiac, which was of great importance in the 16th century. The astronomical clock also displays various figures, including Vanity, Avarice, a Turk and a skeleton named Death. Around the calendar dial are the figures of an angel, a philosopher, an astronomer and a chronicler. When the clock struck the hour the twelve apostles peep out of a window that opens to display them.

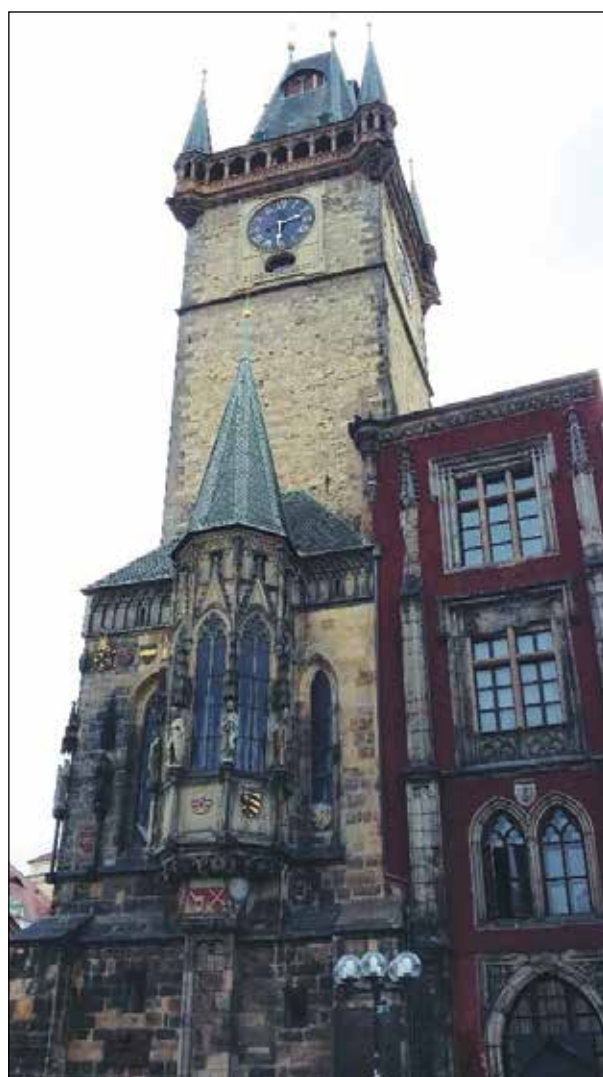
The next stop was the Observatory on Hradcana, a lovely tree-rich hill overlooking the city of Prague. Standing next to the Petrin observatory looking around the green fields and trees I wondered for a moment where Johannes Kepler would have been standing as he watched the conjunction of Jupiter and Saturn in the beginning of December 1603.

The Kepler museum is situated in the house where he lived. It contains a wealth of information about his observations as well as history of his private life and friendship with Tycho Brahe.



With a pair of feet that could hardly walk anymore I still simply had to go to the old Tye Church to see the last resting place in the church floor of Tycho Brahe with his statue in front of the altar to the side of the first pillar. While he, too, had the idea that the earth is the centre of the universe he was still shown due respect with this last special resting place.

On my way back, the following day I was left pondering about music, history, astronomers and speeches in faraway places.



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every sale, purchase, and expense must be properly documented to ensure the integrity of the financial statements. This includes keeping receipts, invoices, and bank statements in a secure and organized manner.

Next, the document outlines the process of reconciling the books. This involves comparing the company's internal records with the bank statements to identify any discrepancies. If there are differences, the accountant must investigate the cause, such as a missed deposit or an incorrect recording of a transaction.

The third section covers the preparation of the financial statements. This includes the balance sheet, income statement, and cash flow statement. Each statement provides a different perspective on the company's financial health. The balance sheet shows the company's assets and liabilities at a specific point in time, while the income statement shows the company's profitability over a period.

Finally, the document discusses the importance of reviewing the financial statements with management. This allows the company's leaders to understand the company's financial performance and make informed decisions about future operations. It also highlights the need for transparency and communication between the accounting department and management.

A Dedication to Deep-Sky Observing

I hope and trust that my contribution can assist in revealing the wonders of the universe which are indeed a wonderful reality that unveiling itself to us. That these results on some of my favourite objects will motivate others to try observing and recording deep sky objects and develop their own dedication to astronomy.

Magda Brits Streicher



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This includes not only sales and purchases but also expenses and income. The document provides a detailed list of items that should be tracked, such as inventory levels, customer orders, and supplier invoices. It also outlines the procedures for recording these transactions, including the use of standardized forms and the importance of double-checking entries for accuracy.

The second part of the document focuses on the analysis of the recorded data. It describes various methods for identifying trends and anomalies in the financial records. This includes comparing current performance with historical data and industry benchmarks. The document also discusses the importance of regular audits to verify the accuracy of the records and to detect any potential fraud or errors. It provides a step-by-step guide for conducting these audits, from the selection of samples to the final reporting of findings.

The final part of the document addresses the communication of the results of the financial analysis. It emphasizes the need for clear and concise reporting to management and other stakeholders. The document provides a template for a financial report, including sections for a summary of findings, a detailed breakdown of the data, and recommendations for future actions. It also discusses the importance of maintaining transparency and accountability in the reporting process, and provides guidance on how to handle any questions or concerns that may arise.

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The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial data. This includes not only sales and purchases but also expenses, income, and any other financial activities. The document provides a detailed list of items that should be tracked, such as dates, amounts, and descriptions of each transaction. It also outlines the proper format for recording these entries, ensuring that they are clear, concise, and easy to read. The second part of the document focuses on the process of reconciling the records. It explains how to compare the recorded transactions with the actual bank statements and other financial statements to identify any discrepancies. This process is crucial for detecting errors, such as double entries or missing transactions, and for ensuring that the records are accurate and up-to-date. The document provides step-by-step instructions for performing a reconciliation, including how to identify and investigate any differences. Finally, the document discusses the importance of regular reviews and audits. It stresses that records should be reviewed periodically to ensure their accuracy and to identify any potential issues. It also mentions the role of external auditors in verifying the records and providing an independent opinion on their reliability. The document concludes by emphasizing the overall importance of maintaining accurate and complete financial records for the success of any business or organization.