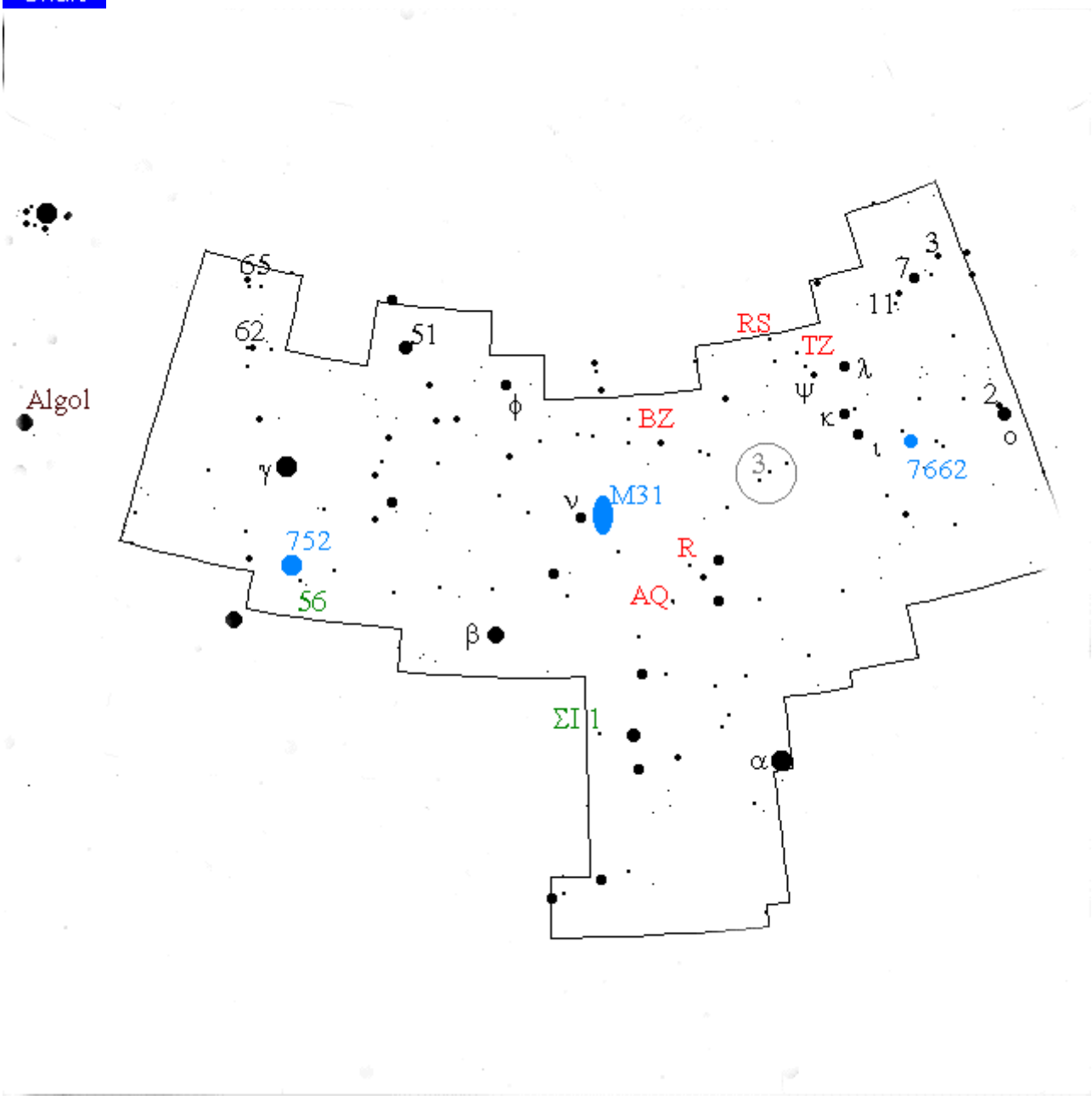
ANDROMEDA

Chart



This fine constellation contains interesting objects of all types, the best-known probably being the *Andromeda Galaxy* (colloquially known these days as just "Andromeda"). Binoculars give a view of this object as a fuzzy oval patch, but do not let that distract you from the many other sights in this large constellation

Groups of Stars

1. The line of 3, 5, 7, 8 and 11, the last of which is a wide double. This group is visible with the slightest optical aid, and there are other stars near 7.

2. 63, 64, 65 and 66. These form a much smaller, and rather fainter group. 64 is noticeably orange in colour.

3. 00h, +42° Small collection of 6th and 7th magnitude stars in the form of a rough V, pointing in the general direction of ι, κ, λ and ψ. This little group used to be known as a separate constellation called *Gloria Frederici* or "Frederic's Glory". It has since been omitted from the official constellations but is still of some interest to astronomical historians.

Wide doubles

o & 2. These form a bright wide pair of magnitudes 3 and 5.

62. Magnitudes 5.1 and 6.1, both white.

Close doubles

ΣI 1. A pair of 7th-magnitude stars separated by 46 seconds of arc.

56. This is a brighter and wider object. Mags are both 6, and the separation here is 182". Close to the fine star cluster NGC 752.

Variable stars

R (6.9-13.3) This red Long-Period Variable is easy with binoculars at maximum, which usually takes place around magnitude 6, though occasionally much fainter. Coming maxima of this star are listed in the appendices. R Andromedae itself as a neighbour of 6.9m which is perfect for estimating when the variable is around maximum.

TZ (7.6-9.0) TZ is situated in a small equilateral triangle near group 3 above, and the other base stars in this triangle are 7.9 and 8.7, so they are good comparison stars.

VX (7.8-9.3) A deep red star of spectral type N, with some good comparison stars in the area.

AQ (8.0-8.9) Easily found near a prominent Y-shaped group made up of ρ, σ and θ, this variable is part of a neat group of seventh and eighth magnitude stars. Like the preceding variable, it is quite red.

BZ (7.5-8.4) A brighter variable in the North of the constellation. It lies between π Cas and an impressive line of 6th and 7th magnitude stars.

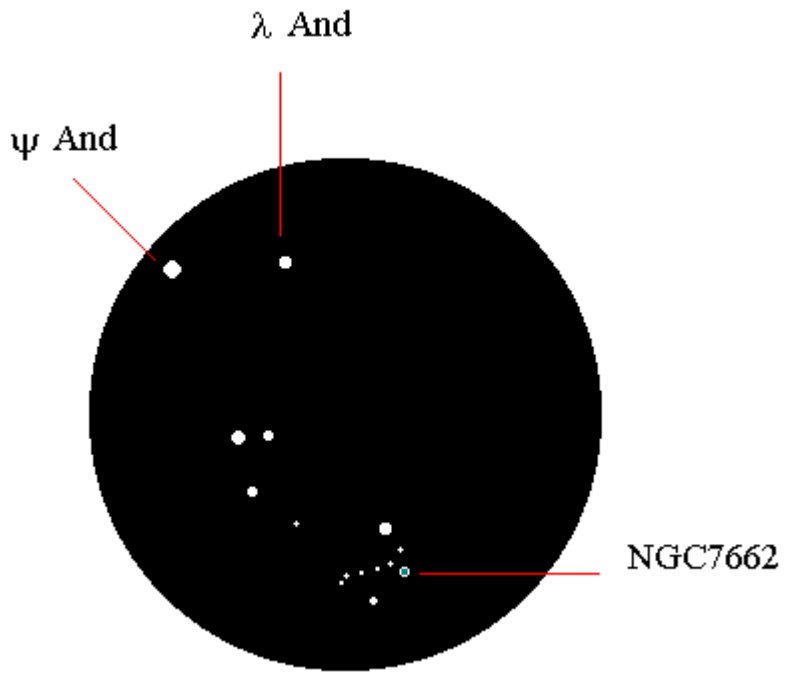
Clusters and Nebulae

M.31 (NGC224). This is the famous Andromeda Galaxy, easily visible to the smallest binoculars. Indeed, I can see it easily with the naked eye whenever the Moon is out of the way, and it was known to the ancients, though of course its true nature eluded them. Its elliptical outline extends over two degrees of sky, and binoculars give a better view

of its size than do most telescopes. Try various observing techniques on M.31; move the binoculars around slowly, use averted vision, combine these two techniques, and so on.

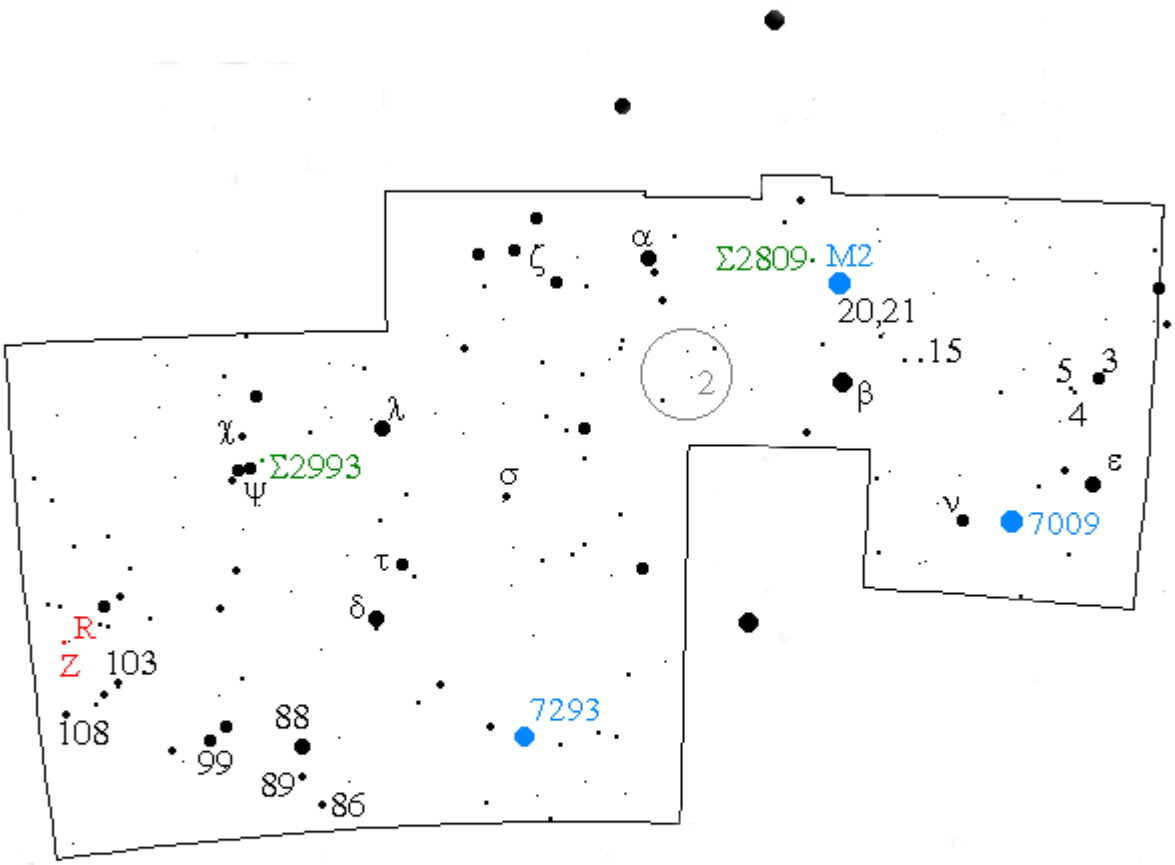
NGC 752. A cluster described by the Hungarian observer Bela Szentmartoni (alas now deceased) as "a great star-cloud, containing faint stars". Well worth the finding.

NGC 7662. A planetary nebula which looks like a faint bluish star. Owners of small binoculars will need to use the chart given here to find it. Planetary Nebulae are remnants of once-giant red stars which, in the course of their evolution and growth, threw off most of their outer atmospheres in a giant shell of gas, which we see as the nebula. All that is left of the giant is a small star at the centre, usually very faint and invisible with binoculars.



AQUARIUS

Chart



A large group with many fine fields, double stars and some interesting nebular objects.Unfortunately most of them are beyond the range of normal binoculars!

Groups of stars

1. Sparse group of 15, 16 and 21 plus 20, a further star of 6.4m.This group is located just North of β Aquarii.

2. 22h, -5°. Larger collection of 6th-magnitude stars in addition to many fainter ones. In a wide field, the area is very attractive.

3. ψ[1,2] and [3]. These form another fine group with some fainter outliers.

4. The stars 86, 88 and 89 form an imposing group along with numerous fainter stars. Not far away is a slightly smaller collection centred around 99 Aquarii.

5. Beautiful group of 103, 104, 106, 107 and 108. Fewer fainter stars here, though.

6. On the border with Cetus is an attractive curved line of 6th and 7th magnitude stars. To find it, locate ι Ceti (3.7) and sweep Westward along the horizon by about 5 degrees.

Wide doubles

4 and 5. Magnitudes 6.0 and 5.5, in an attractive area near 3 (4.6). See if you can spot which are the orange-coloured stars.

β .This star has a 5m companion directly South.

σ and 58. Two stars differing by a magnitude in an interesting area.

δ and 77. This is a slightly fainter edition of σ above.

Close doubles

Σ2809. A good object for large binoculars, the stars of magnitudes 6 and 9 being separated by 31 seconds. Near the cluster M2.

Σ2993. This is associated with group (3) and is even harder than the previous object. Distance only 26".

Variable stars

R (6.8-10). This interesting star can be followed for much of its cycle with binoculars. It is embedded in faint nebulosity and is a "symbiotic" variable made up of two stars which influence each other's evolution and behaviour. Most of the time, however, it behaves as a fairly normal Mira-type star. Even so, you could do worse than observe it once every three weeks. Predicted times of maxima are given in the appendices.

Z (7.2-9.8) A star with quite a large amplitude, though you will need dark skies and large binoculars to catch it near minimum. It lies between the 6m star 1 Ceti and the bright group around R above. It is just to the East of a 6.4m star and a little triangle of 8.1, 8.8 and 9.2 is to be found the same distance to the South of the variable.

Clusters and Nebulae

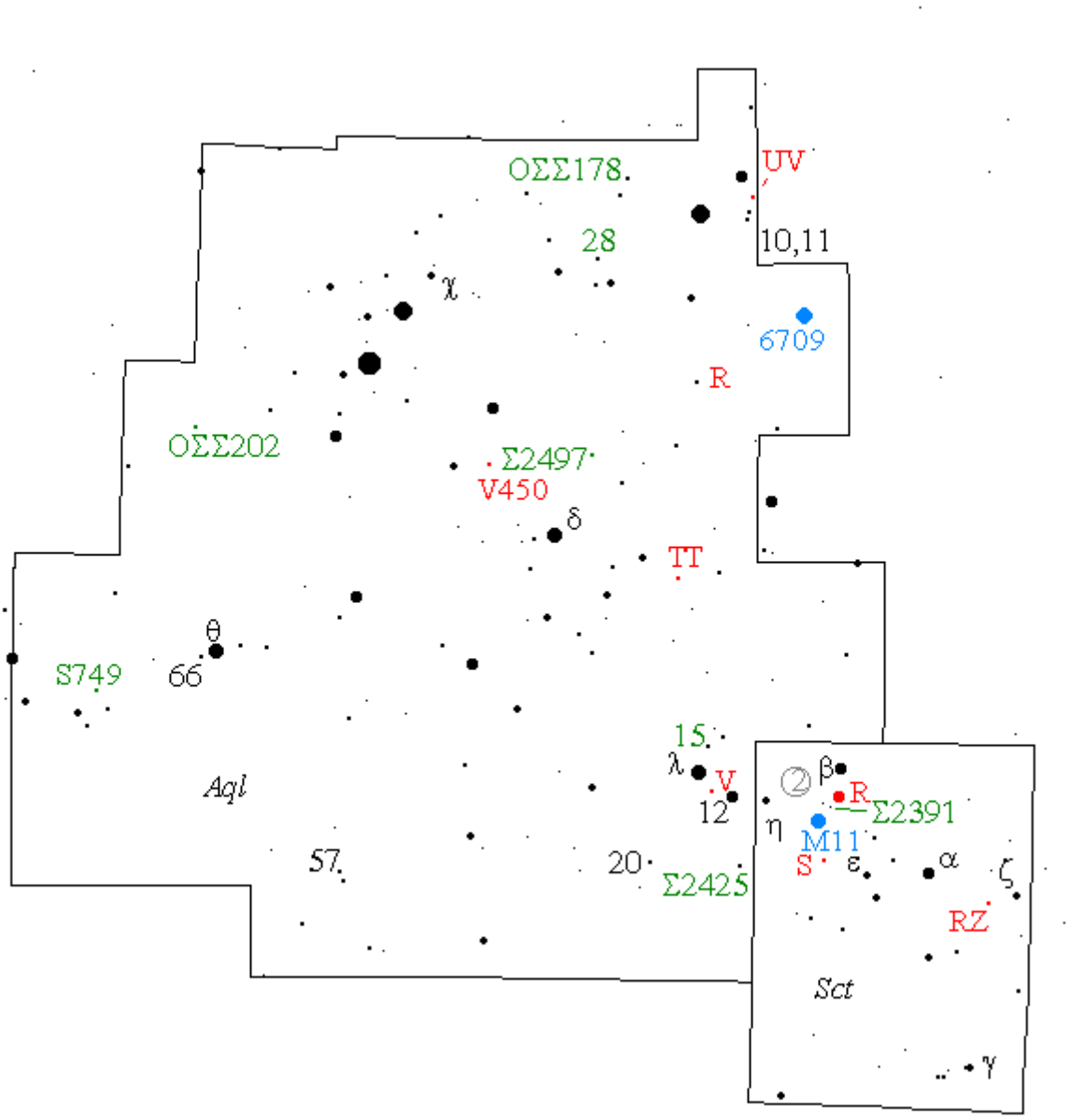
M.2 (NGC 7089) A globular cluster, appearing in 6x30's as a starlike nebulous point. Improves with altitude.

NGC 7009. A planetary nebula near ν , visible as a small spot with 8x30's.

NGC 7293. A large planetary, which class of object Aquarius seems to be well-provided for. 7009 is called the *Saturn* nebula, this one is the *Helix*. These evocative names will not unfortunately convey very much to the binocular observer, as high magnifications are necessary to show these objects to any advantage. But you can at least say that you've found them!

AQUILA

Chart



A constellation with a great store of interesting objects for the binocular observer. Its leader, Altair, is quite close to the Sun, at a distance of 16 light-years. It is in a field of bright stars and dark nebulae are nearby too, but you will need a transparent night and no light pollution to see them.

Groups of stars

1. η Scuti (5.0), the orange star 12 Aql, λ (3.6) and 14 & 15 (both 5.5) form a brilliant group.

2. The region SW and E of δ (3.4) is strewn with bright lines and small groupings of stars.

3. 20. A beautiful fan between this star and 12, though rather nearer the former.

Wide doubles

10 and 11. This 6m pair forms a triangle with ε and ζ. 10 is a small-amplitude variable with an official designation of V1286 Aquilae.

χ and 46. Close to Tarazed (γ Aql) in a fine region.

56 and 57. An interesting wide pair, since 57 is itself a binocular double. 56 is orange and 57 is blue. Together they point South to a wide triple including the 5.6m star 51.

θ and 66. Another coloured pair of white and red. Have a look and see if you can see which is which.

Close doubles

Σ2425. A rather close double (32") of magnitudes 7 and 8.

15. Wider and brighter; the companion is orange.

OΣΣ 178. Magnitudes 5 and 7, separated by 90 seconds of arc.

28. This is one of a bright triangle. It has a faint companion 60" away.

Σ2497. A difficult object of mags 7 and 8, separated by 30 seconds.

57. Magnitudes 5.9 and 6.5, distance 36". Webb *et al* have remarked on the colours; those of the primary have been seen as pale yellow or white, whilst the fainter star seems a bit wilder - pale lilac, bluish, greenish or azure white. After all this, you really will have to have a look for yourself!

OΣΣ202 . An easy pair separated by 43".

S749. A fainter, wide pair in a rich field. Distance 60".

Variable stars

R (6.1-11) This interesting star can be followed for much of its range with binoculars, and times of maximum are given in this book. It is peculiar in that its period has undergone definite changes over time.

V (6.7-8.2) A beautiful deep red star which makes a triangle with 7.1 and 8.3 objects. Easily found when bright because of its colour.

TT (7.0-8.9) A Cepheid type star with a period of 13.75 days. There are several 8th-magnitude comparisons around, but it has to be said that Cepheids are not always the most exciting stars for amateurs to follow for long because of their predictability, though they are good practice objects.

UV (8.3-9.3) Better suited to powerful glasses, this has a neighbour of 8.9m. With large instruments, you may detect this star's deep red colour.

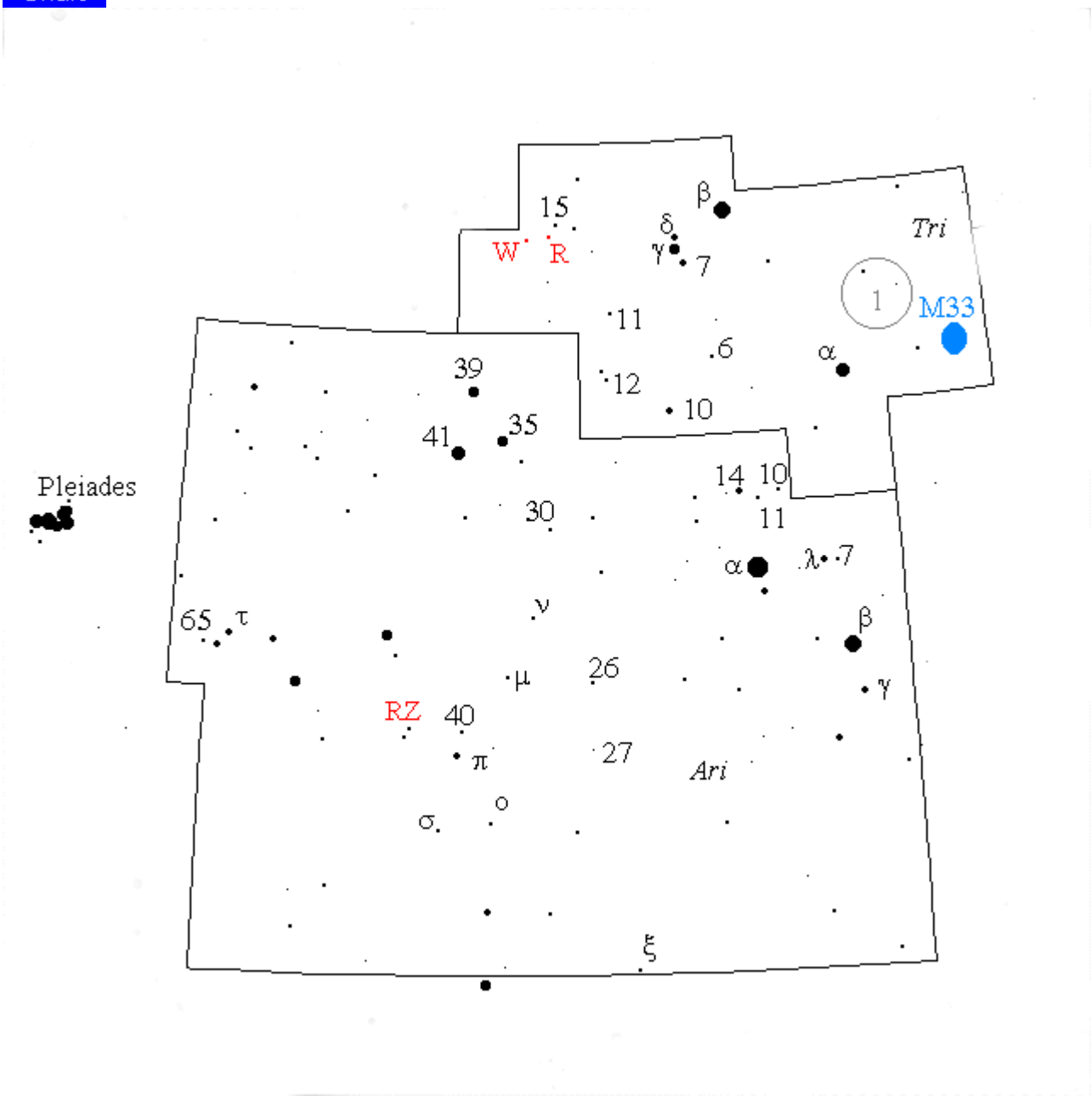
V450 (6.3-6.9) A red star at the right-angle of a triangle (var,6.6,7.0) not too far from Altair. Suitable for the smallest instruments.

Clusters and Nebulae

NGC 6709. A cluster which is best seen in large glasses. Imre Toth sees it as (my translation) "stars around two diffuse parts... about 4 stars can be distinguished". This observation was made with 10x80s.

ARIES

Chart



A rather dull group marked by the stars Hamal, Sheratan and Mesartim. A neat little triangle in the East of Aries used to be called *Musca Borealis* (the Northern Fly).

Groups of stars

1. Three doubles in the same field; 10, 11 and 14.

2. A very attractive area is enclosed by the stars μ, ν, 26 and 27.

3. ξ. Sweep from here to another xi, ξ^2 Ceti (4.3)

4. The large group of o, σ, π ,40 and RZ is worth looking at, and there are fainter stars visible in the area. RZ is of course variable, but its amplitude is too small to concern us here.

5. Another fine group, including τ, 63 and 65.

Close doubles

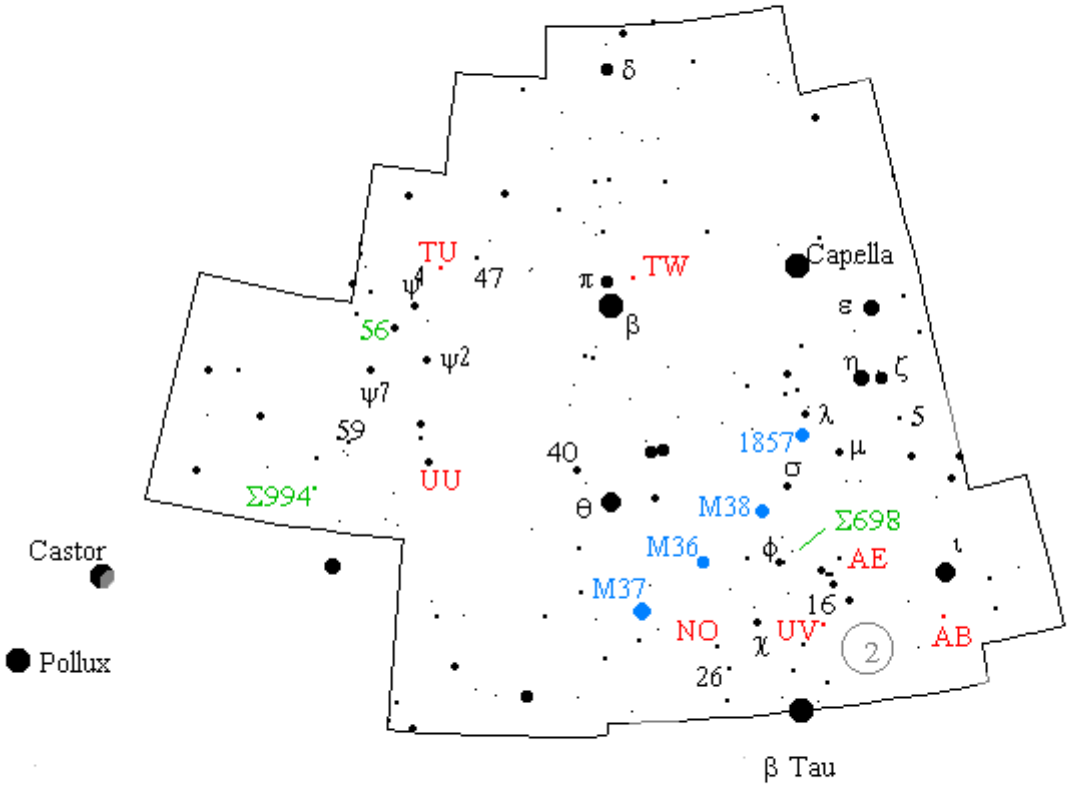
λ. A close pair near Hamal. Mags 5 and 7, distance 38". It makes a wide pair with 7 RR Ari).

14. A triple star of magnitudes 5,8 and 8, distances 93 and 103 seconds.

30. A fine pair of 6.6 and 7.4, 39" apart. Possibly variable.

AURIGA

Chart



A marvellous Milky Way constellation with endless groups of faint stars. The Eastern reaches are quite barren in comparison with the area bounded by the bright stars. Capella, its leader, was known to the Arabian sky-watchers as the "Guardian of the Pleiades". Sir John Herschel thought it had brightened during his lifetime, but there is no evidence for this. Near Capella is the little triangle of ε, η and ζ known as the Kids, held in no mean dread by classical writers. An old couplet runs:

Tempt not the winds, forewarned of dangers nigh,When the Kids glitter in the Western sky

Groups of stars

1. Beautiful collection of hot-looking bright stars around 16 Aur.

2. 5h 12m, +31°. Radiant curving line of 7th- and 8th-magnitude stars. A degree South is a similar, though less striking, line.

3. The area round the bright star β Tauri is worth sweeping. Though not technically in Auriga, this star is clearly part of the pattern, and was actually known at one time as gamma Aurigae.

4. Between μ and σ there are sprinklings of stars of assorted brightnesses. An impressive area.

5. λ . Another star in a fine region, with lines, diamonds and circlets of small stars.

6. The area around χ and φ abounds likewise in fans and lines of faint stars.

7. Bright reversed Y between 40 (5.3) and beta.

8. Prominent group of four stars all bearing the greek letter ψ and distinguished by their superscript numbers of 2, 4, 5 and 7. Try and arrange these in order of brightness - there is not much to choose between them! Also, the area around the second of these stars is rich in faint stars.

Wide doubles

5 and 6. A wide coloured pair, yellow and red.

ψ^8,59,60. All these three are roughly equal in magnitude, though 59 is slightly variable and is also known as OX Aur.

Close doubles

Σ698. In a fine area, this is a close pair (31") of magnitudes 6 and 8.

56. This coloured pair has a separation of 48" of arc.

Σ994. A faint, close double. Mags 7.3 and 8.0, distant by 26 seconds.

Variable stars

TU (8.0-9.1) TU Aurigae lies between ψ^4 and 47 (6.0). Few bright comparisons here, but I have supplied a chart in the appendices.

UU (5.1-6.8) A very red star, suitable for the smallest glasses.

UV (7.4-10) An object for large glasses, this is a symbiotic variable, or possibly a Mira star, near group (2) above.

TW (7.8-9.1) Very easy to find near β. Two stars between this object and the variable are of 8.1 and 8.8 magnitudes. This star illustrates the necessity of actually looking at the sky when doing research of any kind. I had originally planned to select this star for telescopic observation, but on looking at it, found it too bright!

WW (5.7-6.4) A bright eclipser well-removed from the main group. The wide triangle of 49 (5.1) 53 (5.5) and 54 (4.8) can be used here.

AB (7.3-8.5) A nebular variable - not terribly active unfortunately - which underwent a decline in early 1976. It lies between two stars of 6.8 and 7.4m, and has two companions; one of 7.5 directly S, and another which is in fact also a nebular star of the T Tauri variety to the N. This is SU (9.0-9.6) which owners of large glasses might like to look at. I have just glimpsed it with 10x50's.

AE (5.4-6.1) A white variable, in this sense not unlike AB above. AE Aur is an example of what is known rather spectacularly as a runaway star. The theory is that it, along with two other similar stars, 53 Arietis and μ Columbae, were hurled out from the part of the sky now marked by the Orion Nebula by a supernova explosion.

NO (5.8-6.3) This lies close to 26 (5.5) but is rather unsuitable for visual observers because of its small range of variation.

Clusters and Nebulae

M.38 (NGC 1912). Even in small glasses this shows up as a bright oval spot in a rich field.

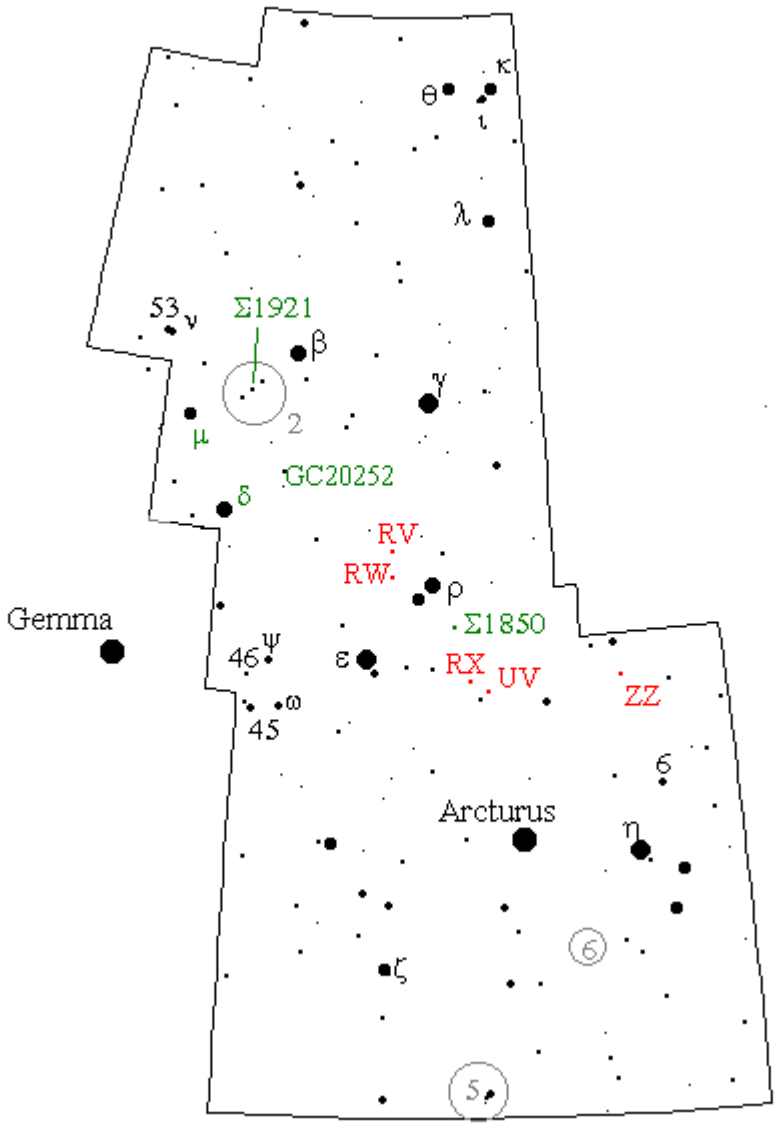
M.36 (NGC 1960). You may be able to see some individual stars in this cluster. Also in a fine area.

M.37 (NGC 2099). The largest of the Messier objects in Auriga, this appears as a large oval nebulosity. Very worth while looking at.

NGC 1857. Visible as a haze beyond an unequal double, one component of which is reddish in hue. Again, a cluster in a very rich area.

BOOTES

Chart



A large group marked by the brilliant Arcturus, mentioned in the Bible. A constellation containing several good double stars, but no nebulae - at least for the binocular observer.

Groups of stars

1. θ, ι, κ. Sweep this area, noting a small, faint triangle directly South of iota.

2. 15h 10m, +39°. A region of several double stars.

3. ζ . Sweep the area a few degrees west of this star.

4. Bright quadrilateral of ω, ψ , 45 and 46.

5. 14h 21m, +8°. Line of three bright stars, including a red one.

6. 14h 08m, +15°. Delicate line of faint stars.

Wide doubles

ι. Mags 4.8 and 6.1. The bright star is also a close double of 4.8 and 7.7 magnitude and 38 seconds separation.

6. The companion to this star is OΣΣ 126, a beautiful pair 86" apart. On the other side of this double is another (7th mag.) star.

ζ. A wide double of 3.9 and 6.0, both white.

ν. This makes a superb wide pair with its neighbour 53. Both equal in brightness but not in colour. Have a look and note your colour estimates.

Close doubles

Σ1850. This 6m star has a fainter *comes* , 26" away.

Σ1921. Two seventh-magnitude stars separated by thirty seconds of arc.

δ. A wide pair (105") of contrasting colours. In the same field is 50 (5.4) with two 8th-mag neighbours, one SE and the other NE.

GC 20252. For all its designation, this is an ordinary 6th-magnitude star, but it does have a faint companion to the NE.

$\mu^{1,2}$ Makes an imposing pair 88" apart. Mu has a proper name, *Alkalurops*. Most of the old star-names come down to us from the Arabs, but this one is a mixture, part Arabic and part Greek. Al- is simply the Arabic word for "the", found in many star-names, whereas the rest of the name comes from the Greek *Kalaurops* , meaning a shepherd's crook or staff.

Variable stars

RV (7.5-8.8) This is near the similar star,

RW (7.5-9.2) Both of these are shown on the chart in the appendix.

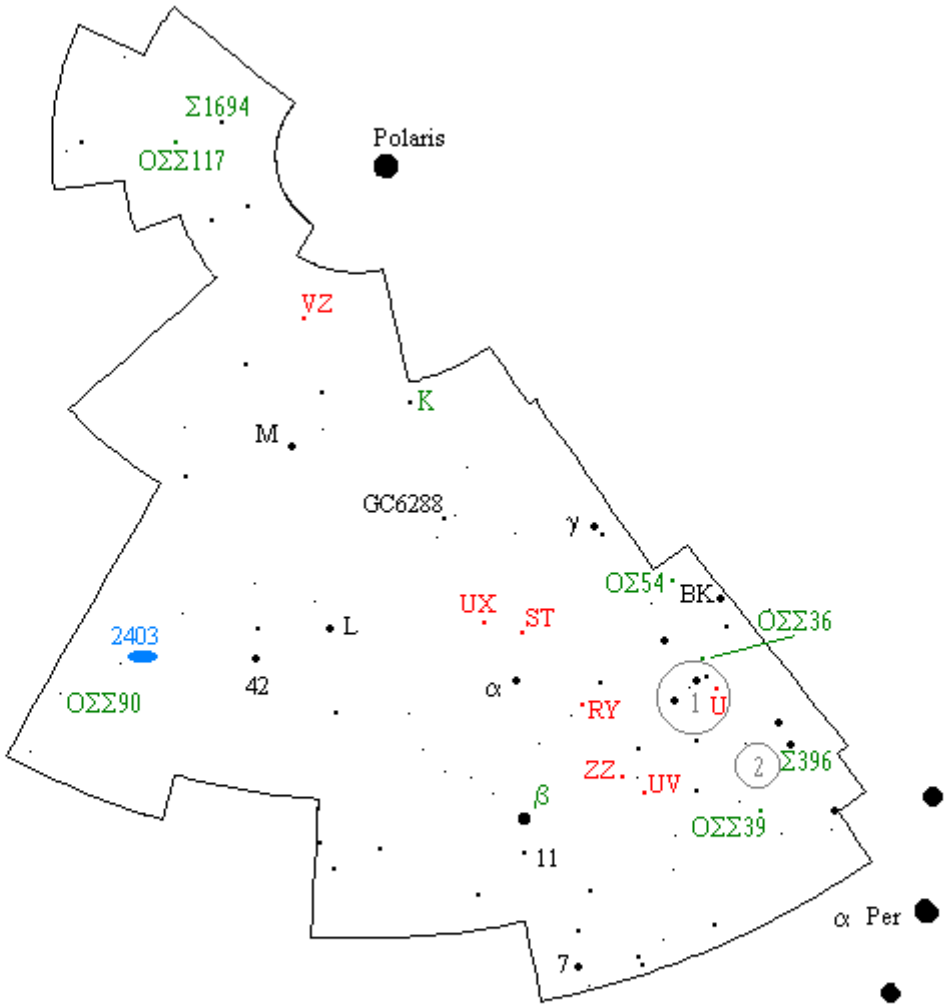
RX (6.9-9.1) An object of similar type to the above, close to a bright comparison of 6.2m. A wide pair of 7.0 and 7.4 are not far away. Note the red colour of RX.

UV (8.0-8.7) An eruptive variable forming a little triangle with RX and its bright comparison. Unfortunately it is not terribly active, and its range is rather on the small side.

ZZ (6.8-7.6) This eclipsing star forms a right-angle with 9 and 11 Bootis. Some useful stars lie to the SE.

CAMELOPARDUS

Chart



This group, faint to the eye, contains a wealth of interesting objects. Clear nights will reveal its chief stars, only of the 4th magnitude; but this is a constellation with a great number of stars just beyond the reach of the naked eye.

Groups of stars

1. 03h 40m, +63°. Bright 5th-magnitude line. Two little lines of faint stars radiate from its easternmost member.

2. 03h 34m, +59°. Beautiful semi-circle of 7th- and 8th-mag stars.

3. GC 6288. This 5.4m star is the centre of a good area for sweeping.

Wide doubles

BK Also called A Cam., this forms a fine pair with OΣ52, a telescopic double star.

11. This 5.3m star forms with its neighbour 12 a pretty object of contrasting colours, yellow and blue.

Close doubles

OΣ54. A difficult pair of 7.4 and 9.1 with a brighter double directly S.

Σ396. A slightly brighter, but very close double at only 20 seconds distance.

OΣΣ36. This double, separated by 41", is the apex of a triangle that points to group (1). A similar South-pointing triangle is close by.

OΣΣ39. Composed of two stars 59" apart whose magnitudes are both 6. Can you see any colour here?

β. An easy object for average-to-large glasses. Magnitudes 4 and 8, distance 80 arcseconds. A blue and yellow pair.

K. Closer at 34". Note a strange little group a degree south.

OΣΣ90. A triple star of magnitudes 5, 8 and 8. Rather isolated.

OΣΣ117. Again an isolated object. The mags are 6 and 8, the distance 65".

Σ1694. A close pair at only 22" but bright and roughly equal. A fainter but wider double lies closely NW.

Variable stars

U (7.7-8.7) A beautiful red star with a rough period of 400 days, so you only need to make one observation per month. It is near group (1), as are UV and ZZ following.

RY (7.3-9.4) This lies near the Eastern member of a line of three bright stars. The figure here shows the immediate area.

ST (6.0-8.0) A very easy star to observe, as it lies in a small pentagon near α, whose other members are of 7.0, 7.3, 7.2 and 7.8m.

UV (7.8-8.4) This is one of a Y-shaped cluster near group (1) although its small amplitude makes observation less easy than some.

UX (7.8-8.8) This star is not far from ST Cam, in a little inverted Y. It has a *comes* of 8.9m which hampers observation with many binoculars.

VZ (4.7-5.2) You might like to observe this star with defocussed binoculars because of its brightness and red colour. A star for the smallest of glasses, or even the naked eye. Too small a range for my liking. Look at it once a month.

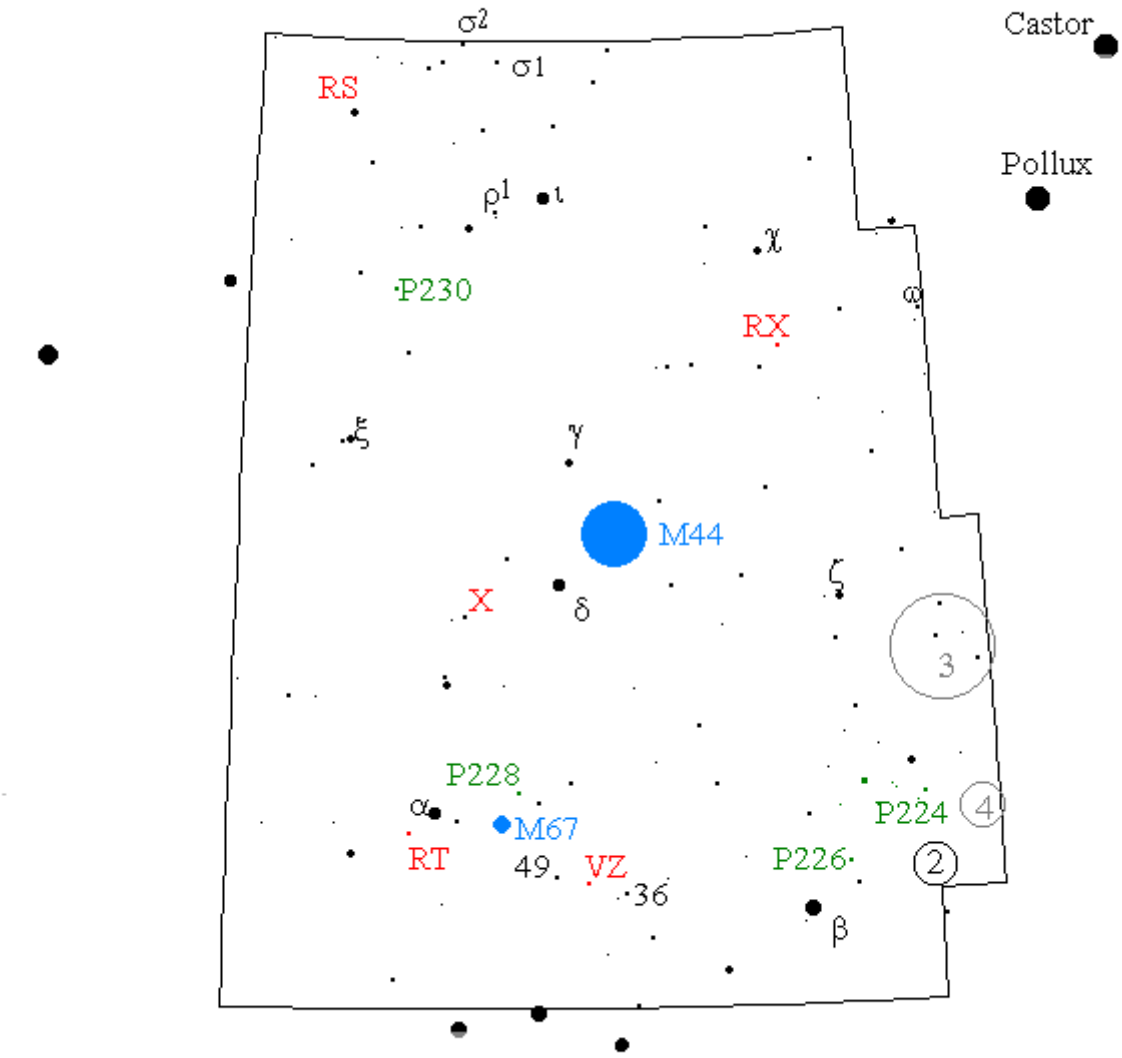
ZZ (7.1-7.9) A red star lying in a neat little cross-shaped group. It is the most Northerly star in the cross. At the centre is a star of 7.5m which is useful for comparison purposes.

Clusters and Nebulae

NGC 2403. A spiral galaxy visible in 7x50s as a brightish oval nebulosity.

CANCER

Chart



A nebulous group to the eye, but containing many fine fields in addition to a notable cluster. In some 17th-century star maps, poor old Cancer is depicted not as a crab, but as a lobster - with a small counterpart, indeed a shrimp, *Cancer Minor*, between Cancer (Major) and Gemini!

Groups of stars

1. β. 1° W of this orange star, and closely S. of a 6m, there is a small circlet of the 7th magnitude downwards.

2. 07h 58m, +10°. Beautiful little group.

3. 07h 58m, +17°. Large collection of bright stars, including 3 (5.8) and 5 (5.9).

4. 07h 54m, +12°. Symmetrical arc of five faint stars.

5. σ [1,2,3]. Included with these are many fainter stars. There are other attractive groups near the borders with Gemini and Lynx.

Wide doubles

ω. A wide pair in a fine field.

β. This 3.8m star has a bright neighbour to the SE. Directly East is a delicate little triple.

ρ[1]. Of 6.1 magnitude, this makes a pair with BO Cnc, a red variable. Well worth looking at with small glasses.

ξ. This forms a much closer pair with 79 (6.1).

Close doubles

ι A beautiful object of yellow and blue. Distance 31 seconds.

P.224. A good, easy object - magnitudes 6.6 blue and 6.7 yellow. The distance is 229".

P.226. Much fainter and closer, this is composed of 8m stars 144" apart.

P.228. Slightly more testing at mags. 6.8 and 8.0. The main star is orange, and the separation is 194".

P.230. A difficult triple star. The faint members, both of 9th mag., are 132 and 179 seconds from the 7.3m main star. There is another faint triple a degree Southwest.

Variable stars

X (5.9-7.3) A deep red star, lying near δ between two comparisons of 6.3 and 6.8, with a 7.1m above the latter. An excellent star for the beginner.

RS (5.5-7.0) Another bright red variable well-provided with useful comparisons.

RT (6.9-8.0) This semi-regular variable is in a small triangle, the apex of which is 8.3m.

RX (7.5-8.9) A similar object in a crowded field. A chart is provided for this star and also the nearby BL Cancri.

VZ (7.2-7.9) Easy to find, this is an RR Lyrae star with a regular period of 0.178 days, or only 4 hours 15 minutes! This means you could follow a whole cycle during one evening's observing. It lies exactly halfway between 36 and 49 Cnc, the latter of which is slightly variable and is also called BI Cnc. It is a shame that VZ has few useful stars nearby.

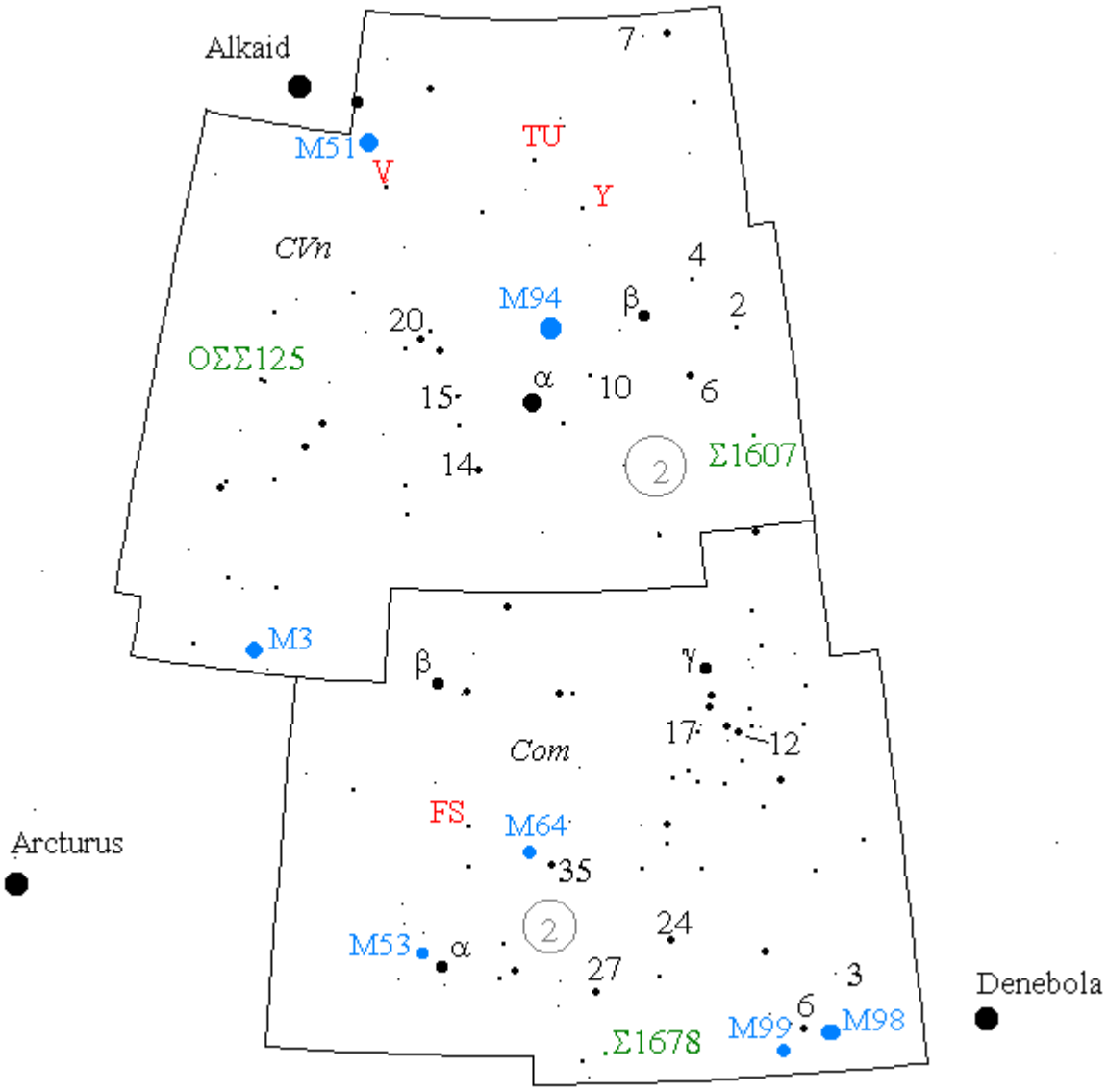
Clusters and Nebulae

M.44 (NGC 2632) Known as the Beehive, this is the only cluster in the sky to have a hairdo named after it. A perfect object for small glasses, which will reveal many triples, doubles and streams of stars. Looking at this cluster with the naked eye certainly shows you why it is called the Beehive - but you need binoculars to see the bees!

M.67 (NGC 2682) A small, but prominent, cluster between 50 and 60 Cnc. Appears as a misty patch.

CANES VENATICI

Chart



An apparently dull group to the eye, but holding some fine doubles and bright variables. The hunting dogs themselves were called *Asterion* and *Chara*. β is still occasionally given this name in some astronomy books.

Groups of stars

1. The region around 9 and 10 is quite rich in stars.

2. 12h 32m, +37°. Line of three faint stars below a 7m.

3. 2, 4 or AI, 6 and β form a large quadrilateral with many fainter stars within its perimeter.

4. 20 (4.7). Other bright stars around this object.

5. The area bounded by Cor Caroli (a), 20 and 14 is quite rich - at least for this part of the sky!

Wide doubles

7. Magnitudes 6 and 8. One of a right-angle.

15 and 17. A wide, equal pair in a fine field.

Close doubles

Σ1607. Two 8m stars separated by 33 seconds of arc.

α. 2.9 and 5.4. A closer double of similar hues, i.e. yellow/reddish.

OΣΣ125. An unequal pair of magnitudes 5 and 8. Distance 71".

Variable stars

V (6.8-8.8) An interesting red variable lying between two 6m stars. Observe it twice a month.

Y (5.2-6.6) With a rough period of 158 days, this star is of a beautiful red colour, which led Secchi, in the last century, to call it *La Superba*. Y itself lies a degree North of a comparison star of 6.3m.

TU (5.8-6.3) This lies in the same field as Y CvN, and is likewise a degree North of a useful star, this time of 6.2m.

Clusters and Nebulae

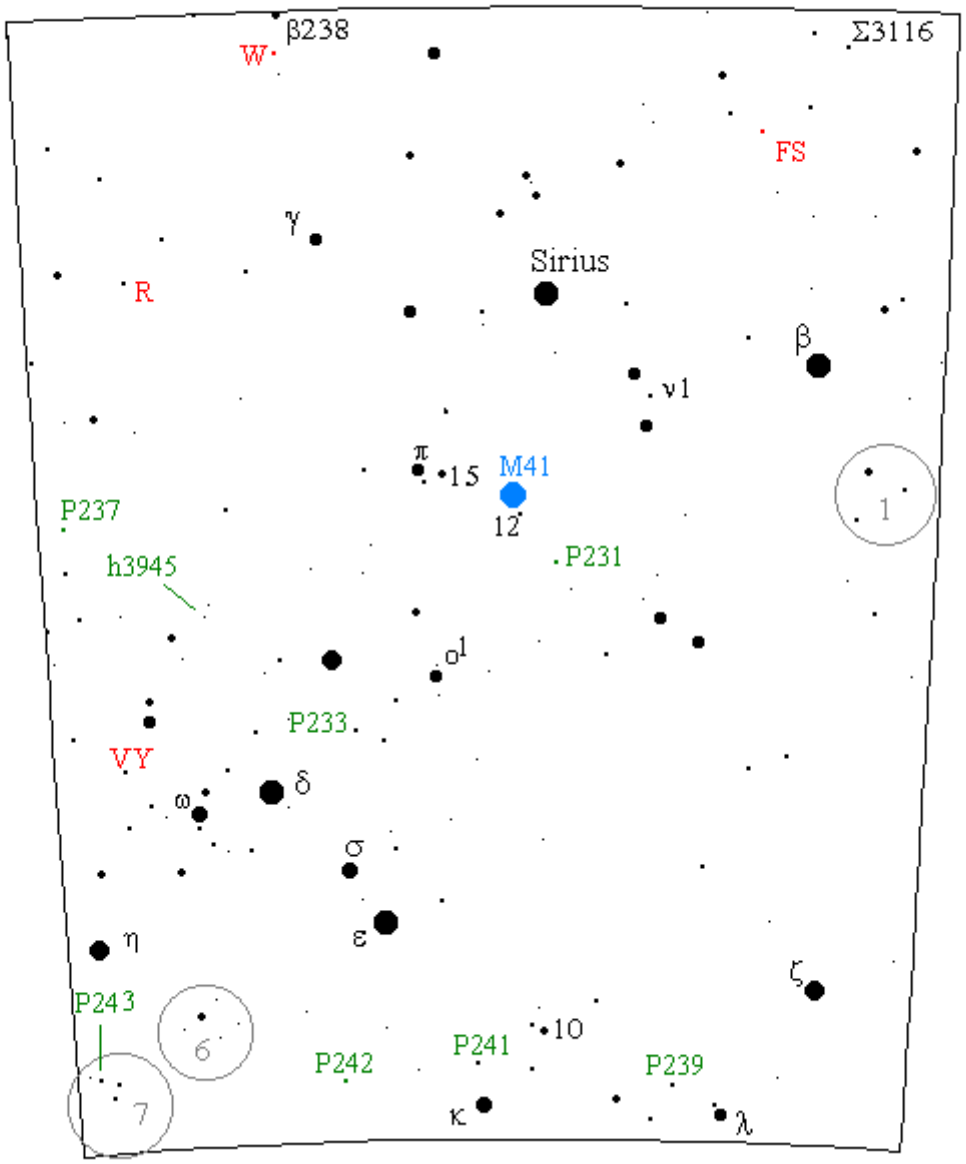
M.3 (NGC 5272). A globular cluster which appears in small glasses as a nebulous star.

M.51 (NGC 5294). This is a distant galaxy, to be found as a misty patch of light near Alkaid, the end star in the bear's tail.

M.94 (NGC 4736) Another galaxy, appearing in 6x30s as a faint starlike object.

CANIS MAJOR

Chart



A rich constellation pointed out by the brilliant white Sirius, brightest of all the stars. Sirius was sacred to the Egyptians among others, and gives us the "dog days" when its rising just before the Sun presaged stifling weather, presumably because then Sirius would be aiding and abetting the Sun! As Smyth pointed out in 1881, however, the British dogdays "often commenced a fortnight after the veritable dog-days were ended". Somehow this does not surprise me.

Peculiarly, several classical writers asserted Sirius to be red in colour, but there are no good astrophysical reasons for such a change. One theory supposes that Sirius could

have been veiled by a cloud of interstellar dust, which does have a reddening effect upon stars behind it.

Groups of stars

1. 06h 16m,-20°. Large triangle of bright stars.

2. ζ . Beautiful areas near this star

3. 15 and π . Wonderful sweeping around these stars, especially with powerful glasses.

4. η . This is one member of a brilliant curving ray that extends to ω.

5. β238. Many bright stars around this telescopic double.

6. 07h 12m, -31°. Fine, singular collection of 6m stars.

7. 07h 25m, -32°. Smaller, brighter group that includes some fainter stars.

Wide doubles

Σ3116. This forms a wide pair with a red star, and there are others nearby.

10. The companion to this star is a faint double.

o¹. A red star with a 6th-magnitude companion directly S. Two more companions to the N and SW.

π and 17. These form a wide double, with 15 (4.7) nearby. There is another very wide, bright pair a degree or so to the North.

Close doubles

η . Magnitudes 2.4 and 6.9. Distance 180".

ν¹. A very difficult object. Distance only 15", so only to be tried for with large glasses, and even then not for the faint-hearted!

h3945. A beautiful coloured pair, red and blue; but still close at 27".

P.231. A faint (8th-mag) pair separated by 151 seconds.

P.233. Very difficult, this is a triple star whose primary of 5.8m overshadows the 9th-magnitude attendants, which are 131 and 216" distant.

P.237. Rather easier this time - magnitudes 6.7 and 8.3; distance 99".

P.239. A close pair in a fine area. Mags. 5.7 and 7.7 but only 26" apart.

P.241. Just North of κ , this is an unequal pair of mags 5 and 8 separated by 42 arc-seconds.

P.242. Wider but fainter, these stars are of 7.9 and 8.9. Distance is 132".

P.243. A fine object lying in a beautiful little group of bright stars. The mags are 5.4 and 8.0, and the distance is 99".

Variable stars

R (6.2-6.8) An eclipsing binary with a 1.1-day period. A small line of three lies closely SW. Their brightnesses are (N to S) 7.4, 6.8 and 6.6.

W (6.9-7.5) Easy to find from its deep red colour, W CMa lies inside a fine triangle formed by β328 above and two other stars of 6.4 and 7.0. A fainter star of 7.7m lies directly N.

VY (6.5-9.6) A peculiar "slow" variable lying between two bright stars. It lies just NE of one of these, from which a small line of 7.0, 8.8 and 9.2 runs Eastward below VY.

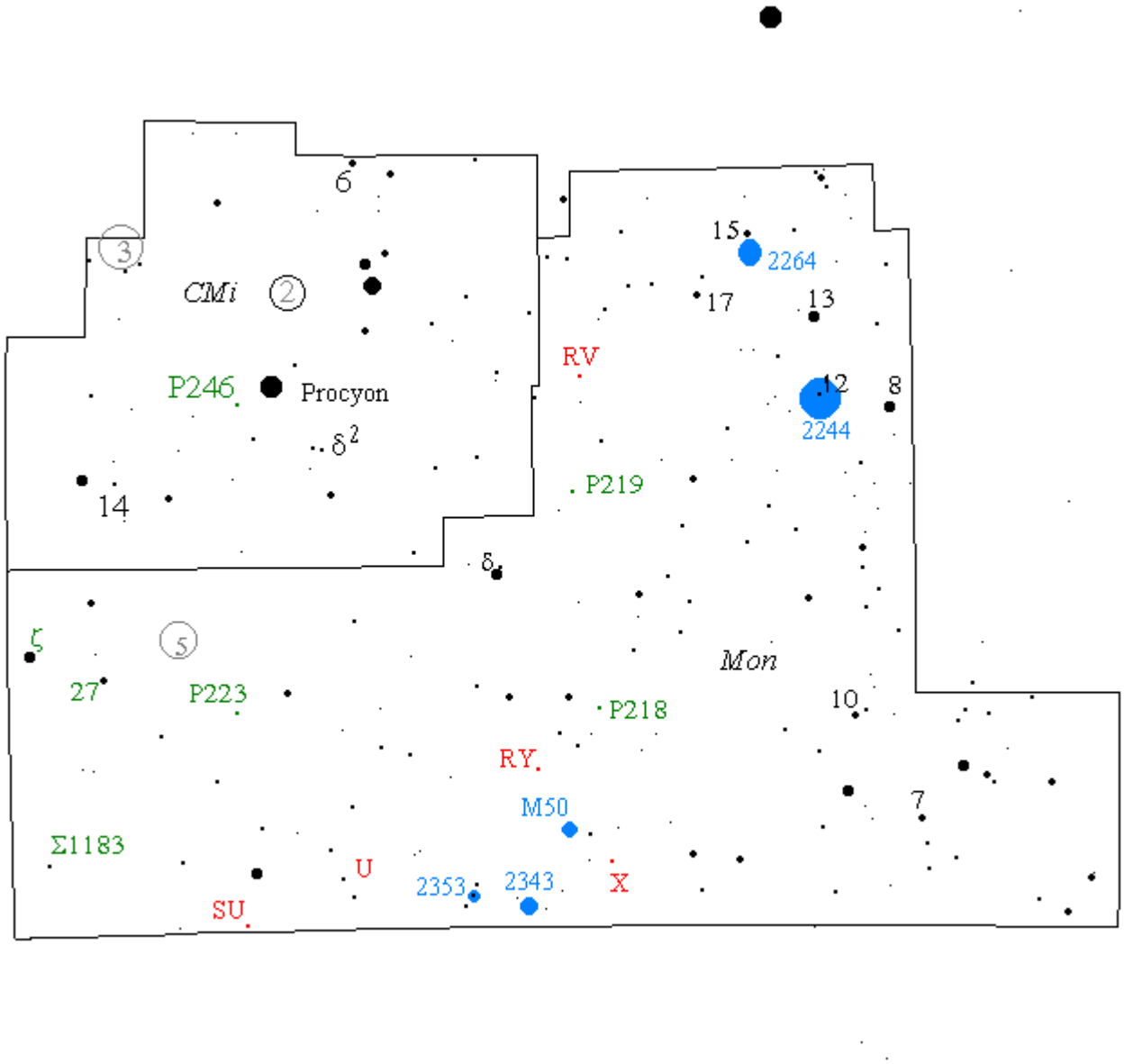
FS (7.6-8.6) Another out-of-the-ordinary star, similar to the "shell stars" typified by P Cygni. These are very hot, luminous objects. It has a companion of 7.4 closely East, and another of 8.7 directly N.

Clusters and Nebulae

M.41 (NGC 2287). This open cluster is a fine object, especially in large binoculars, which may resolve some of its members. In small glasses, it appears as a ragged, glowing patch.

CANIS MINOR

Chart



A small, unremarkable group containing few interesting objects for us. Procyon is, like Sirius, a near-at-hand, bright star with a dense white dwarf companion, though of not so extreme a type.

Groups of stars

1. 6 (4.9) is in a fine field of bright stars.

2. 07h 37m, +08°. Three faint pairs in a curve.

3. 07h 55m, +10°. Some sprinklings of bright and faint stars.

Wide doubles

δ^2. Makes a wide pair with δ^3. There are two fainter stars SE of the latter.

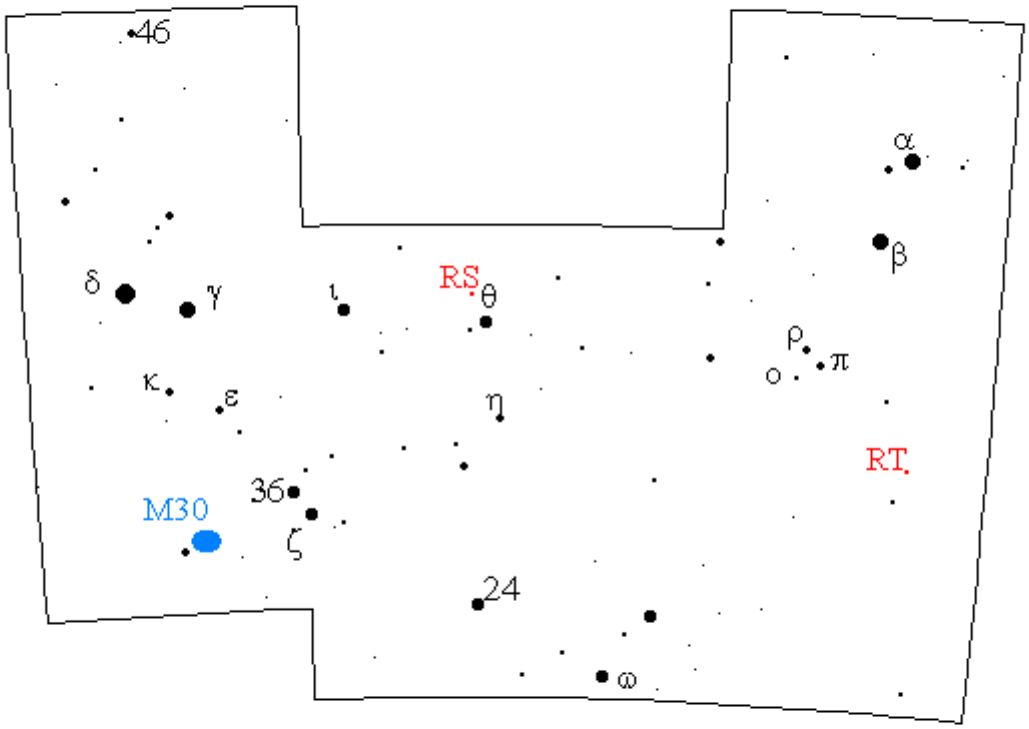
Close doubles

14. A fine triple, suited to large glasses. The distances of the two faint comites are 86" and 117".

P.246. A difficult, unequal pair of 6.7 and 8.7m. The distance is 184", with a third star of 8.6m also nearby.

CAPRICORNUS

Chart



A large, triangular group, well supplied with binocular objects, though observers in the Northern USA and Europe may have some difficulty here.

Groups of stars

1. Very large, Y-shaped group that includes the 4.2m θ.

2. δ (3.0) is the leader of a fine parallellogram.

4. ζ (3.9) and 36 (4.6) are members of a large, wandering arc extending to η (4.9).

Wide doubles

α A beautiful naked-eye pair. With binoculars, note also two fainter stars,

r and π . Make a wide triple with o.

46 and 47. The first of these is a close, difficult triple; the second is a small-amplitude variable, AG Capricorni.

Close doubles

o. Very difficult at only 22 seconds of arc separation.

Variable stars

RS (8.0-9.1) A red star, with a small triangle of 7.3, 7.5 and 9.0 just North. RS itself has a companion of 8.9m.

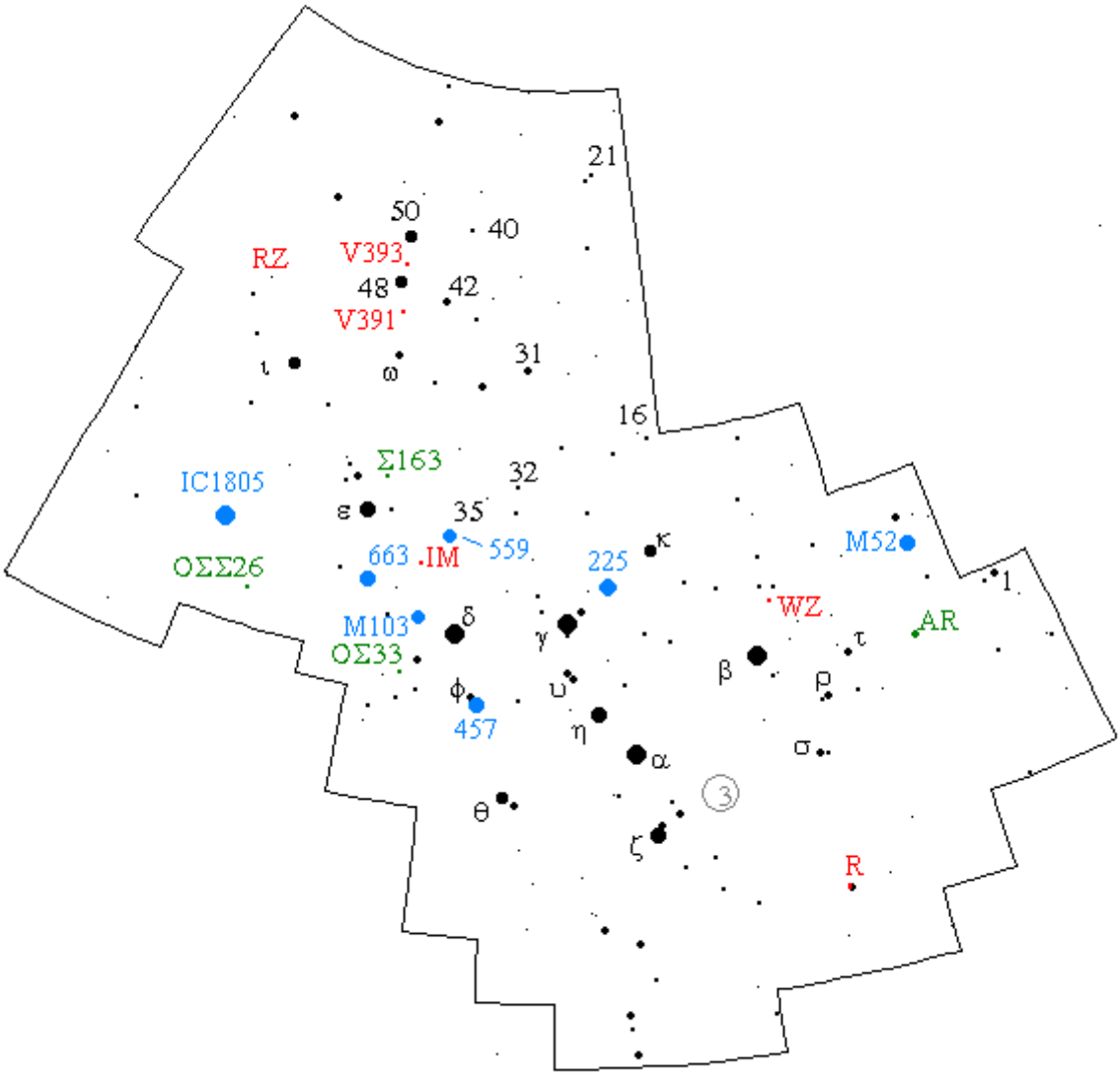
RT (6.4-8.1) Located conveniently closely to the 6.0m star 4 Cap., I have supplied a chart for this variable in the appendices.

Clusters and Nebulae

M.30 (NGC 7099). A bright, starlike spot, this is a globular cluster close to the 5th-magnitude star 41.

CASSIOPEIA

Chart



An obvious group to the eye, and full of memorable objects and marvellous fields. The shape of this constellation lent itself to all manner of mythological interpretations; to the Inuit it was a lamp of stone, to the Arabs an open hand; to the Greeks a lady in a chair, while in the cosmogony of J.R.R.Tolkien's Middle Earth it appears poetically as *Wilwarin*, the butterfly.

Groups of stars

1. Line of 3 bright stars, τ , ρ and σ. The second of these is an interesting variable star. A fine region.

2. Sweep around kappa, where there is a fine angular Y.

3. 00h 28m, +55° 20'. Small faint circlet.

4. ζ (3.7). Sweep southwards from here.

5. κ (4.2). Interesting area N., that includes 16, an unequal pair.

6. Large triangle of RU (32 Cas) 35 and GC1426. All three are doubles of varying distances and brightnesses.

7. Fine field around 40, 42, 48 and 50, all of magnitude 5.

8. Large, fine arc of 31, ψ , 43 and ω .

9. ε . This has three faintish companions directly E, plus a bright triangle to the NE. The region between this star and 35 is rich in doubles, lines, and groups of faint stars.

10. An area of brilliant groups between δ and the previous star that includes M.103.

Wide doubles

1 and 2. A bright pair in the area of the well-known variable V Cas. The fainter of the two (i.e. 2 Cas) has an 8th-mag companion.

σ . Another wide, bright pair. The companion is of 5.7m.

ζ This has a 5.1m star NW, which in turn has another again NW.

21 and 23. 21 is the variable YZ Cas. A poor field.

υ1 and 2. A faint star between the two is a good test for average-to-large binoculars.

Close doubles

35. A difficult pair (B rather faint in 20x70s) though 52" apart.

OΣ33. A more equal but closer pair at only 25"

Σ163. Quite a difficult object, but of contrasting colours. Note a bright little triangle to the East.

OΣΣ26. A much easier object, though harder to find. Mags are 6.9 and 7.4 and the separation is 64".

OΣ496. The primary is AR Cas, of small range, and actually a quintuple star. Only one of the four companions is seen with bins at 7.1m and 76" distance.

Variable stars

R (6-12) Even though this star reaches 6th magnitude normally, I have seen it as bright as magnitude 4 to 5! It lies about a degree North of a 6.8m star which is useful as a comparison, though there are few brighter stars in the area. R Cas is a very red star, and predictions are given in the appendix.

RZ (6.4-7.8) An eclipsing binary of period 1.2d. A star of 7.7m lying a degree to the W. can be used to estimate RZ when at minimum.

WZ (6.9-8.5) A beautiful deep red star lying in a triangle of 6.2, 6.4 and 6.6m stars. WZ has a close blue *comes* of 8.4m which can prove a nuisance when the variable is near minimum.

IM (7.7-8.5) When I began drawing up a chart for this star, the figures in the variable-star catalogue led me to believe that this would be a telescopic variable. When I turned my telescope on it, however, it proved to be much brighter! I have supplied a chart for this red star.

V391 (7.6-8.4) This lies near group (7) as does the following variable. Two useful stars are close by; one between 42 and 48 of 7.7m, and another between this and the variable of 8.7. The three lie in a straight line.

V393 (6.8-7.9) A companion closely E is of magnitude 7.6.

ρ (4.1-6.2) This is a peculiar giant star which tends to spend most of its time around magnitude 5. It is one of those objects which are too bright for most bins, but just too faint for the eye to estimate well. Sigma (4.9) and tau (5.1) serve as good comparison stars.

Nova 1993. This was discovered by Kanatsu in Japan on Dec 7, 1993 at magnitude 6.5, rising to 5.7m by mid-month. At the time of writing in Feb.1994 it was around magnitude 8 and had undergone large fluctuations en route. Satellite observations suggest that it may decline abruptly, only to surge back later. Only time will tell. Another nova flared up in Cassiopeia in 1995, and is currently (Jan 1999) at about magnitude 12.

Clusters and Nebulae

NGC 225. A faint smudge in 10x50, but in 20x70, some stars can be seen, bordered by a 9th-magnitude curving line.

NGC 457. A beautiful oval gleam attached to ϕ. A few faint stars can be seen in large glasses.

M.103 (NGC 581). In 6x30s this appears as a diffuse spot. Using 10x80 glasses the Hungarian observer György Zajacz sees a "very faint, hazy nebulosity in the centre of four faint stars".

NGC 663. A good binocular target. In 20x70s, I see numerous stars, including two pairs and a triple before a white gleam.

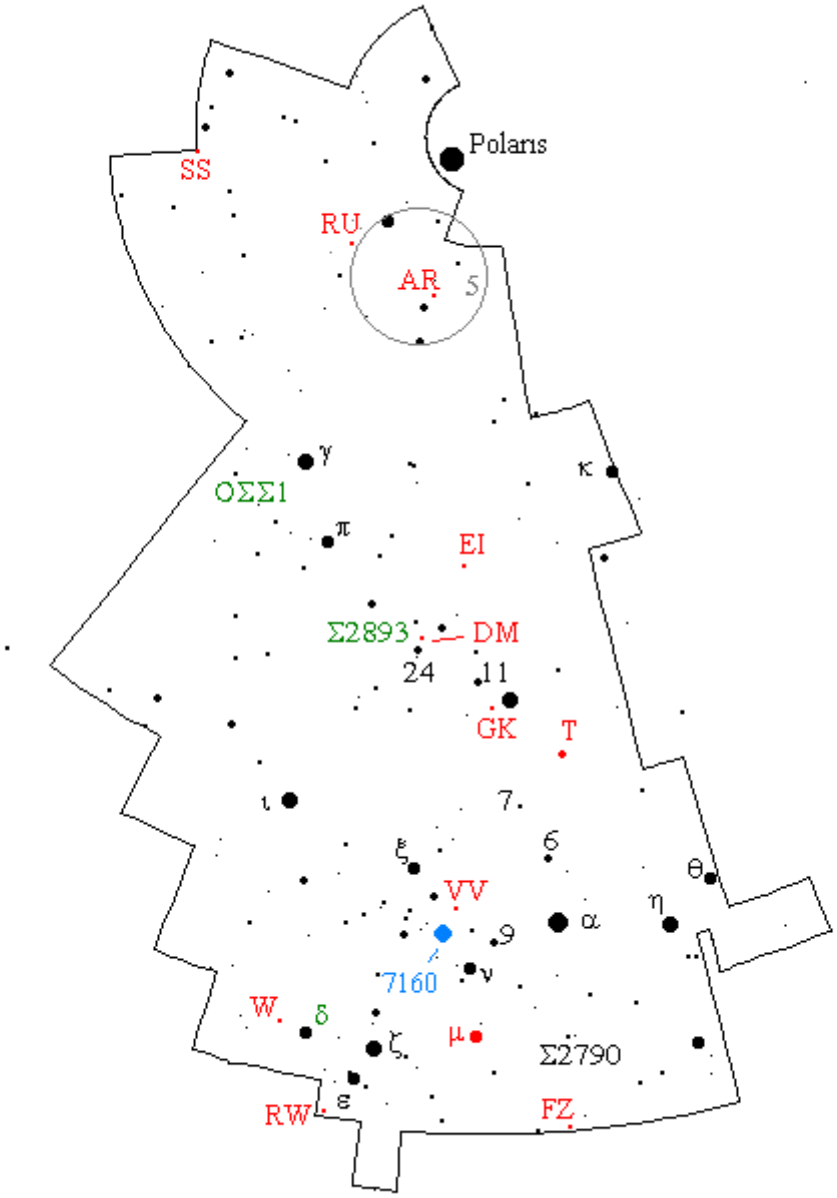
M.52 (NGC 7654). A rather faint cluster, but in a fine field.

NGC 559. Visible as a misty patch near a long triangle.

IC 1805. A fine field for most glasses and well worth locating.

CEPHEUS

Chart



Just as fine a group as Cassiopeia, though not so vivid to the naked eye. Many beautiful Milky Way fields.

Groups of stars

1. 6 (5.2). Closely East is a small quadruple star.

2. A degree NE of 9 (4.9) is a 6m star with a tiny group to its North.

3. Large group including 11, 16 and 24. Note the small faint Y near 24.

4. Slowly sweep the triangle bordered by ξ , ι and ζ

5. 00h, +86°. Large bright group, similar in shape to the Pleiades, but much larger.

6. The little naked-eye triangle of δ , ε and ζ is very beautiful with even the slightest optical aid.

Wide doubles

η . About a degree South is a wide double of 6.0 and 6.1.

Σ2970. This telescopic pair forms a wide double with a 6.4m star which is also a telescopic double.

7. There is a fine orange pair of the 7th magnitudes just SE.

Close doubles

OΣΣ 1. A wide pair of 7.1 and 7.9. Colours are said to be red and yellow.

Σ2893. A close but easy pair near group (3). Distance 28".

δ . The primary is the typical Cepheid variable; but that aside, it is a lovely coloured pair whose yellow and blue stars are 41" apart.

Variable stars

T (6.0-10.3) You will need large bins to cover the whole of T's range, but any optical aid will show it at maximum. It lies just North of a straight line of 7.1, 6.7 and 7.7 and two little stars of 8.1 and 9.2 point right at it. Predictions for maxima of this star are given in the appendix.

W (6.9-8.6) A red star found between δ and two stars of 6.3 and 6.8, and furthermore between two closer ones of 7.5 and 8.3.

RU (8.2-9.4) A faint star in group (5), indeed rather too faint for most binoculars.

RW (6.2-7.6) This is one of a bright parallellogram whose other stars are 6.2, 6.4 and 6.6m. A good star for the smaller glasses and incidentally one of the most luminous stars known.

SS (6.7-7.8) A rather isolated far-north star which stands between a line of 5m stars and a bright Y. Two useful stars of 7.2 and 7.6 lie to the NE.

VV (6.7-7.5) A ramarkable eclipsing system with a period of twenty years! The large red component is more than 1000 times the diameter of the Sun, so that if it were placed in the centre of our system, all the planets out to Jupiter would actually orbit inside it.

AR (7.1-7.8) An easy star to find, in group (5). It is one of a line, lying between two stars of 6.2 and 7.1. A further 7.3m star makes an equilateral with these two. This star was thought to be an RV Tauri star at one time, though recent observations indicate a change of period from 324 to 364 days. More observations are needed to confirm this.

DM (7.0-8.2) Again easy to find, this red star has a companion of 8.7, with a wide pair of 7.5 and 8.0 just W. of the nearby 24 Cephei.

EI (7.6-8.1) Though of small range, this bears watching as there is some evidence of variation outside its normal eclipsing behaviour. A 6th-mag star lies nearby, and between this and EI is a vertical line of 6.7, 6.9 and 7.5. The variable itself has a neighbour of 8.0 to the east.

FZ (7.0-7.6) Another small-amplitude star, this time a red one in a very dense field on the border with Cygnus. Worth finding for its colour.

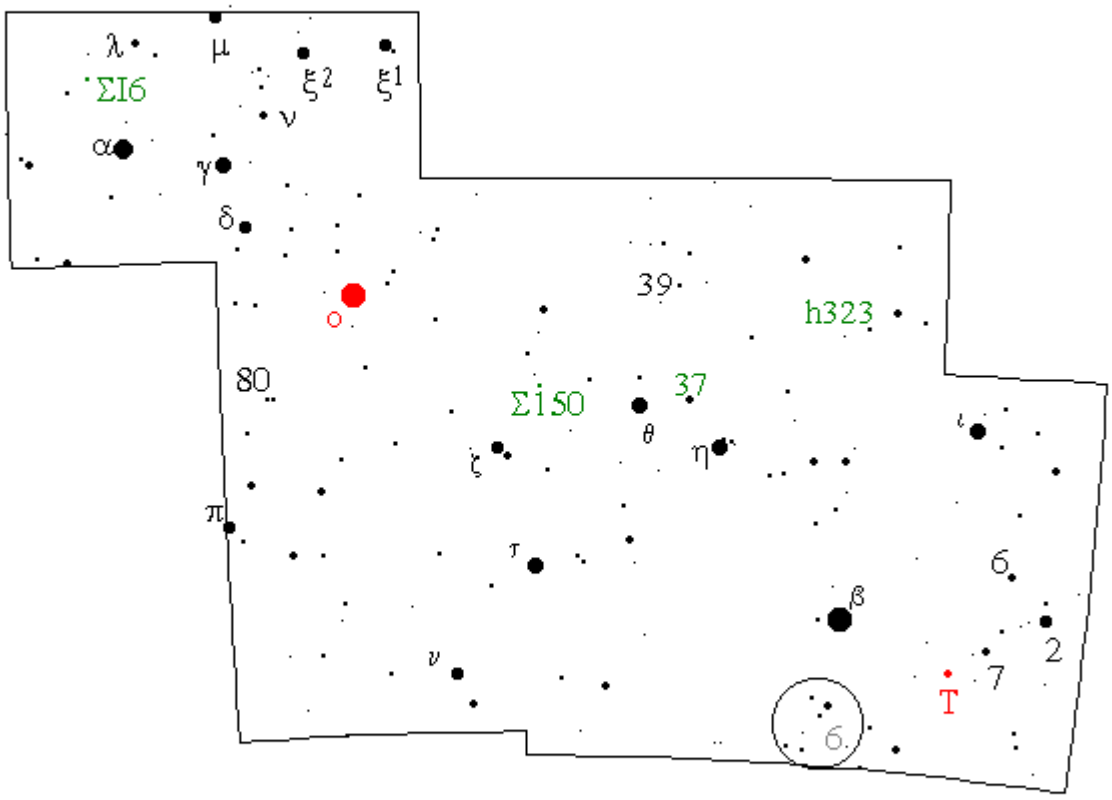
GK (6.9-7.5) Near beta Cephei or Alfirk, this is a beta Lyrae star. A star of 7.2m lies on the opposite side of Alfirk, and two additional comparisons of 7.1 and 7.4 form a south-pointing isosceles with the 5th-mag 11 Cephei nearby.

Clusters and Nebulae

NGC 7160. A fine cluster, some stars being distinguished in binoculars. A wonderful region closely N and W.

CETUS

Chart



A very large group with some fine fields in its southern reaches, and of course the famous variable star Mira.

Groups of stars

1. Large group of seven, including AY or 39 Cet (5.5)

2. η (3.6). Note a group of four bright stars closely NW.

3. δ (4.0). A fine gathering just south of this star.

4. ν (5.0). An interesting region to the N.

5. The triangle of 2, 6 and 7 (AE Cet) outlines some attractive small groups of stars.

6. 00h 40m, -20°. A region of many bright stars, including a 5m triangle.

7. Striking trapezium led by π.

Wide doubles

77 and 80. The latter also has a faint star close by.

Close doubles

h323. A faint pair 65" apart. Note a faint diamond Northwards.

37. A fine green and blue double.

Σ150. Rather elusive at 36". A neat pair lies NE.

ΣI 6. A wide pair 81" distant. Easy with most glasses.

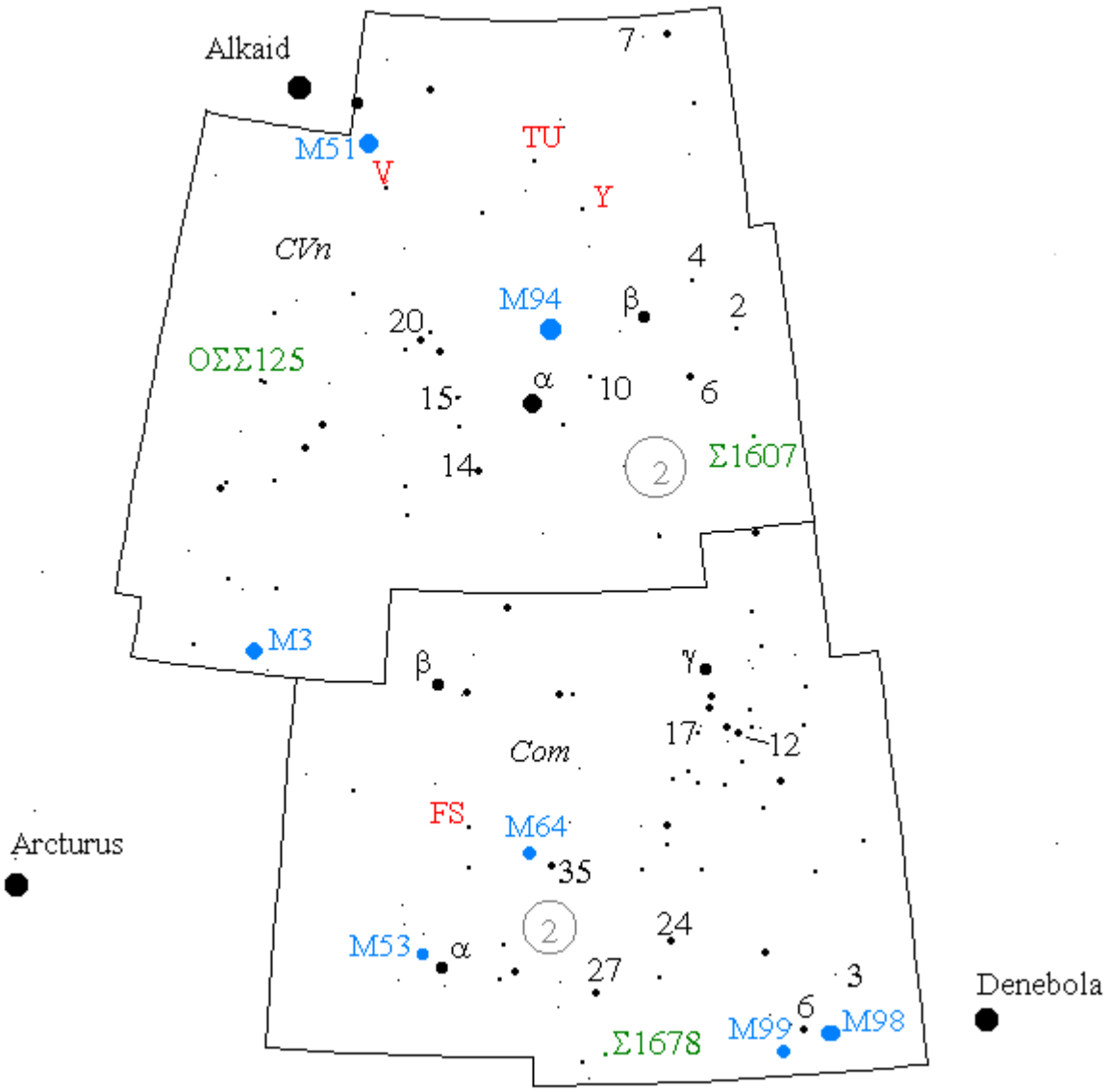
Variable stars

T (5.1-7.0) A chart for this bright, easy variable is supplied in the appendices.

o (1.7-9.6) These are the extreme values of Mira; the maxima in particular vary from one cycle to the next. All the well-known astronomical societies issue charts to follow it with; it is never out of binocular range for very long.

COMA BERENICES

Chart



A beautiful part of the sky to the eye, the lovely star-glow being caused by a particularly large cluster, beyond which is a much larger diffuse sheen which is due to vast numbers of faint galaxies abounding in this area.

Groups of stars

1. Mel 111. This is the brilliant large cluster just south of γ(4.6), readily visible on a clear night. Use the smallest glasses possible on this group - a cluster in the last place you would expect to find one, as far removed from the plane of the Milky Way as possible.

2. 12h 50m, +19°. Small group of magnitudes 6 and 7. One of their number is triple (7.7,8.2,8.3).

3. α (4.2). Just to the NE of this star there lies a small collection which includes two wide pairs.

Wide doubles

3 (6.4). Closely S. is an unequal, wide double.

12 (4.7). This has two faint companions.

17. Otherwise called AI Com, this has a 7m attendant which is actually a telescopic double.

27. A 5.3m star with a close neighbour of 8.2. One of a bright triangle.

Close doubles

24. A difficult yellow and blue pair, only 20" apart.

Σ1678 Wider but fainter, this makes a triangle with 28 and 29. Near the latter is a slightly fainter close double.

Variable stars

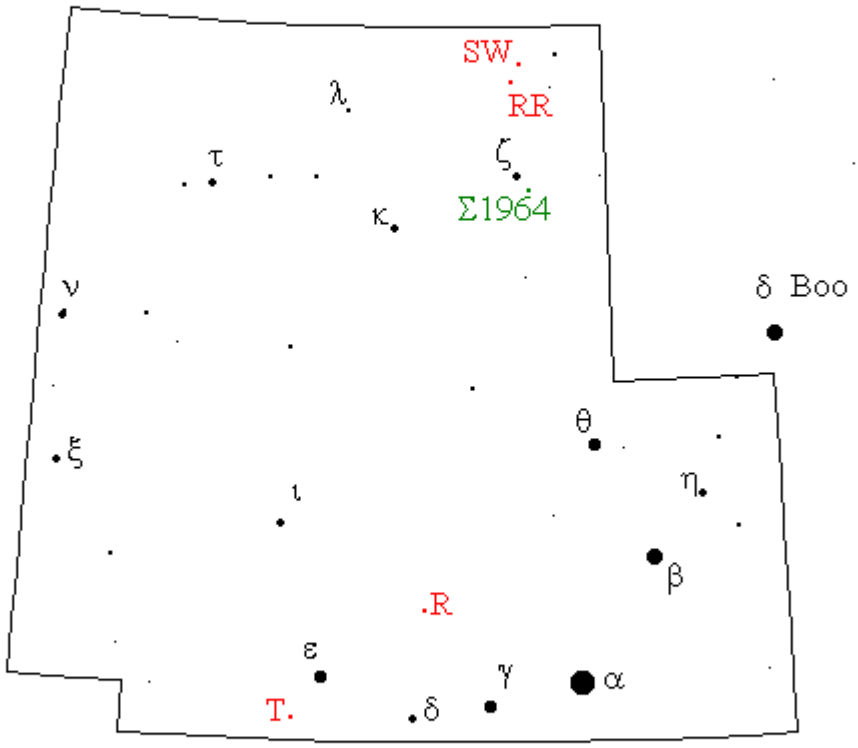
FS (5.3-6.0) A rather underobserved star which would be good for owners of small glasses but for its poor light range. 35 Com (5.1) and 39 (6.0) make good comparison stars.

Clusters and Nebulae

There are innumerable distant galaxies in this part of the sky, where obscuration from the gas and dust in our own Galaxy is at a minimum, thus allowing us to see their faint light. Few, unfortunately, are good binocular objects. The most notable are M.64 (NGC4826), known as the "black eye" galaxy, and M.53 NGC5024), a globular cluster. The two galaxies M.98 and 99 are faintish, but could be worth hunting down.

CORONA BOREALIS

Chart



A group bearing a striking resemblance to its mythological model, though extending some way beyond the actual crown shape itself. Among its notable objects are two fascinating variable stars well-suited to binocular owners.

Groups of stars

1. Large, roughly triangular group of κ, λ and τ. An interesting area for sweeping around, especially near tau.

2. ε (4.2). Some faint groups to the SE of this star.

Wide doubles

ζ This wide pair is made up of 5.0 and 6.0m stars.

η Two wide, but rather faint pairs a couple of degrees south.

ν A bright reddish pair with a third (8th-mag) star nearby.

Close doubles

Σ1964. A critical test-star for larger glasses, only 15" apart, and quite close to zeta. An eighth-magnitude companion lies NE.

Variable stars

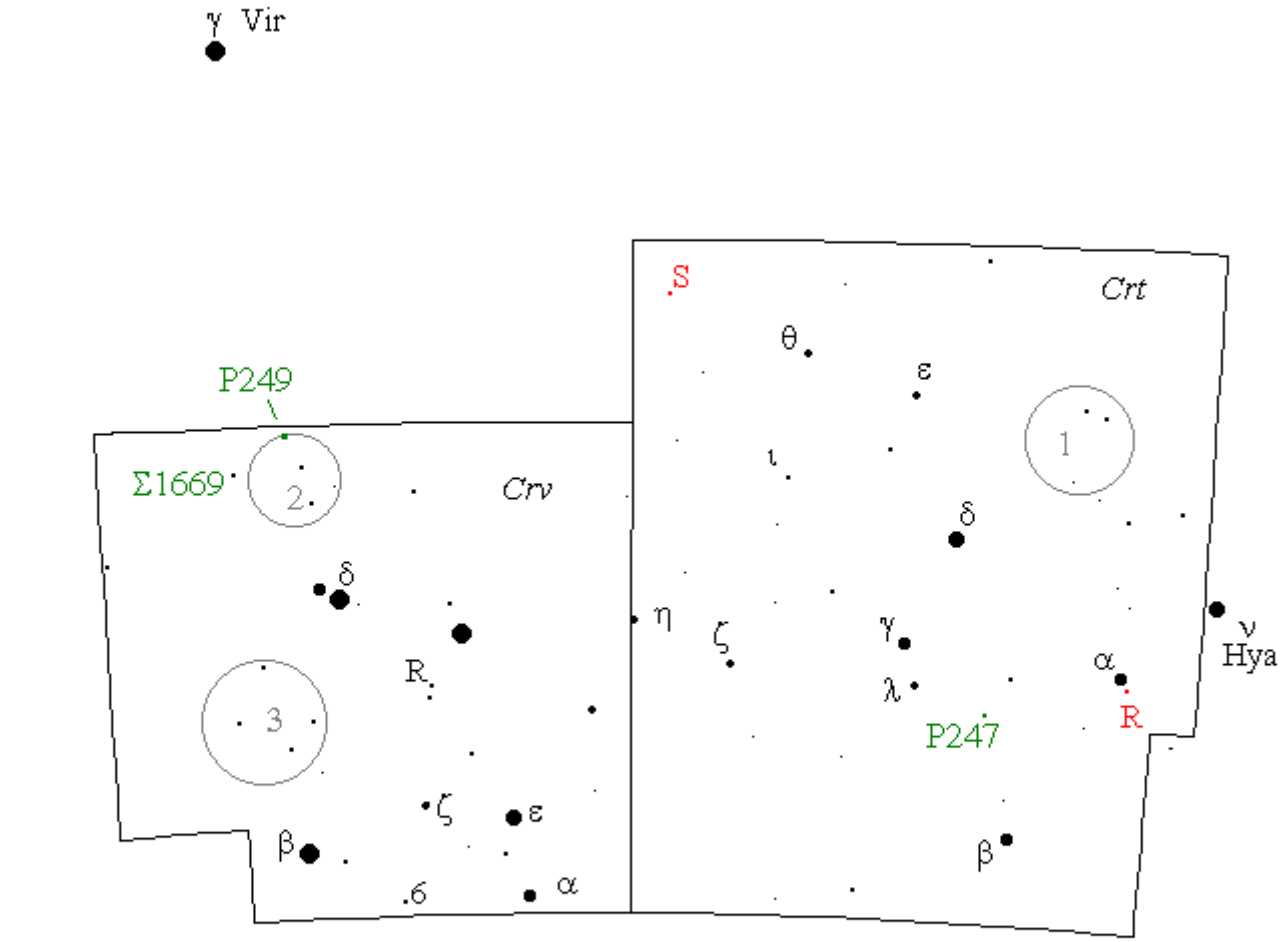
R (6.0-14) The prototype of its class, affectionately known as "Sooty stars" because from time to time, and without warning, they eject clouds of Carbon which then condense into soot and cut off most of the star's light. Pollution on a grand scale! This star thus needs constant watching - and amateurs with binoculars are the best people for the job!

T (2.0-10) In terms of its light-changes, this is a mirror image of the preceding star, and is known as a *Recurrent Nova*. It spends most of its time at minimum (beyond the reach of most binoculars) but at long intervals undergoes a violent outburst. The last of these occurred in 1946, but the binocular watcher may well be the first to spot its next explosion. I have supplied a chart in the back of the book.

RR (7.1-8.6) Back to normalcy now, with a red variable which, together with its slightly less-variable neighbour SW CrB (7.6-8.3) can be compared against a nearby 8.1m comparison star.

CORVUS

Chart



A small though distinct group rather lacking in interesting objects. It is one of those constellations in which the greek letter system seems to have gone somewhat askew, as its brightest star is not α, which is actually one of the lesser stars. Some nineteenth-century observers also had trouble with β, and thought it could be variable on a slow time-scale - a "secular variable". Have a look at Corvus and draw its shape, labelling the stars in order of brightness.

Groups of stars

1. Sweep around the area bordered by alpha, epsilon and zeta.

2. 12h 32m, -13°.Beautiful long inverted Y. The northern star is quadruple (6.8,8.5,8.7,6.6) with another group of four 1° NE, whose members of 8.1,8.3,8.4 and 9.1 might be seen in large glasses.

3. 12h 36m, -19°.Bright 6th-magnitude trapezium, one of which is a wide double.

Wide doubles

ζ This bright star has a 6th-mag companion.

δ and ε. Between these stars, in a barren area, is a 6m star that makes a fine pair with the Mira variable R Corvi (6.7-14) on those occasions when R is bright - a sort of "part-time double".

6. An attractive wide pair in a fine field.

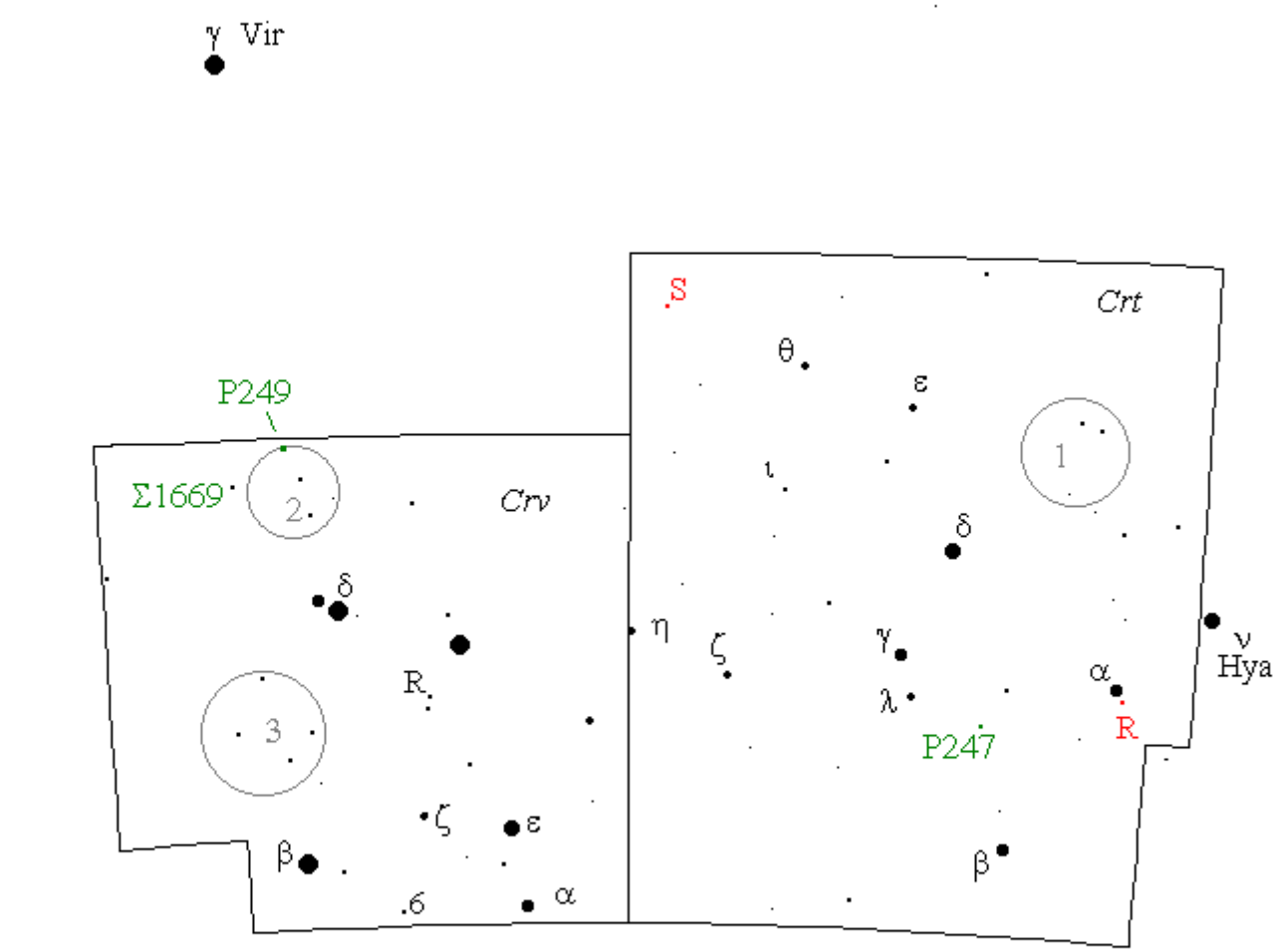
β Note the delicate unequal pair to the SW.

P.249 This triple is wide but difficult because of the faint companions of 8.5 and 8.7, both about 160" from the 6.8m main star. Another 6th-magnitude star is close by.

Σ1669 A telescopic pair, this has a distant neighbour.

CRATER

Chart



Like Corona, this bears a good likeness to the object it is supposed to be; and like the preceding constellation, contains few interesting sights.

Groups of stars

1. 11h 00m, -12°. Large collection of fairly bright stars.

Wide doubles

ι This 5.6m star has a 6.8m orange attendant.

Close doubles

P.247 A wide, unequal pair (6.8,8.4; 205")

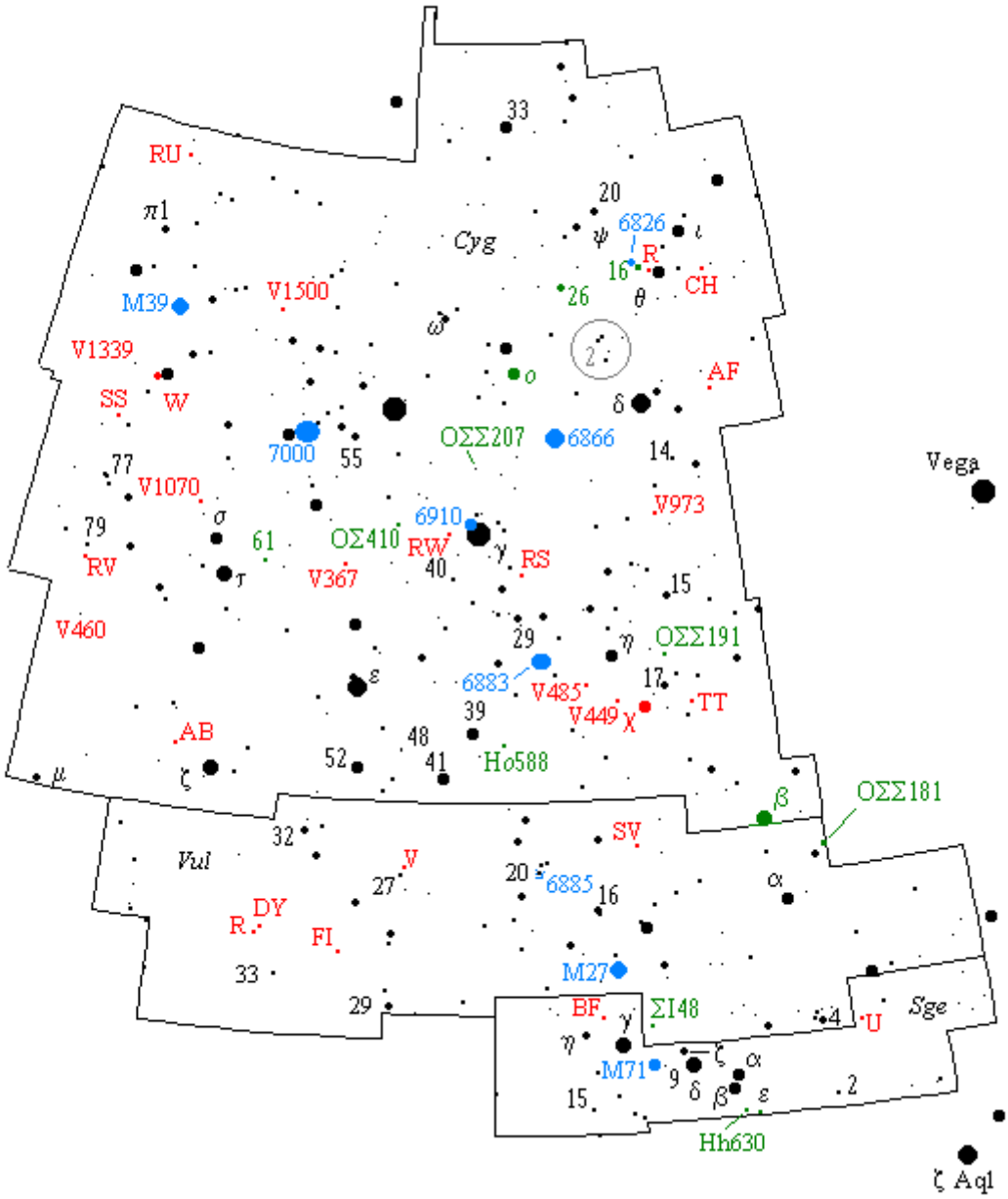
Variable stars

R (8.0-9.0) Easy with a telescope, but two close companions, and the proximity of α make this an object really suitable for powerful glasses with high magnifications.

S (8.2-9.2) A bit easier but still rather faint, and there are few useful stars in the area for comparison purposes.

CYGNUS

Chart



Certainly the best constellation in the whole Northern heavens for binoculars (or anything else for that matter) It contains many notable objects, including Cygnus X-1, prime candidate for black-holedom. Deneb, the leader of Cygnus, is a real celestial searchlight thousands of times more powerful than the Sun. It is also known as Arided, to my ears at least, a beautiful name for a star - but then Cygnus has it all!

Groups of stars

1. θ and ι . Brilliant fields around these stars.

2. 19h 50m, +47°. Rather singular bright Y of magnitudes 5 to 6.

3. Marvellous meandering line that includes ψ (4.9) and 20 (5.2).

4. Fine, large semi-circle ending at 33 (4.3).

5. NE of Deneb, near 55 and 57, are some of the most radiant areas of the Summer heavens. Dark skies and large glasses may pick out several nebulous gleams here.

6. π^1 (4.8). Note the beautiful line snaking away to the NW.

7. Large bright group, including δ and 14.

8. Long, sinuous trail, rambling through areas of breathtaking splendour, and stretching from 15 Cygni right through to 40.

9. γ . The central star of the cross marks probably the richest part of the constellation, and is a brilliant area to the naked eye. This whole region gives the impression of countless stars arranged layer upon layer, and the 19th-century Irish observer John Birmingham called it the "Red Region of Cygnus" because of the large number of red stars in the area. Excellent sweeping from here towards the fourth-magnitude η , which is in another magnificent region, star-clouds being visible with small glasses.

10. Large and bright irregular pentagon of 39, 41, 47, 52 and ε. Large bins, no light pollution, and dark skies will enable you to glimpse the Veil Nebula supernova remnant in the region of 52.

Wide doubles

θ . Directly E. is the well-known L.P.V. R Cygni (click on it for dates of maxima) which reaches mag. 6 at times. On the other side of theta is another star of 6.6m, and just West of this lies a large triple of 5.7, 7.8 and 8.3.

ω . A red star with a fainter associate. One of a bright group in a fine field.

γ . 1°N is a fine wide pair of 6.1 and 6.4, attached to the open cluster NGC 6910.

29. A star with a companion to the SW. Both these stars are also fairly wide doubles.

48. A beautiful equal pair, both white.

σ and τ . An unequal wide double forms a little triangle with these stars.

77. A 5.5m object with a seventh-magnitude attendant.

79. These stars are similar in brightness to the preceding objects.

μ . Directly North there lies a wide double of 7.3 and 7.4.

Close doubles

β . The famous Albireo is separable with binoculars. With colours of orange-yellow and blue-green, this is one of the sky's showpieces.

16. A fine, equal pair 37" apart. Beautiful in small glasses.

OΣΣ 191. Distance 35", but the companion is faint.

26. Another unalike pair, though rather easier at 42" of arc.

o¹. A wonderful coloured triple. The faintest star is a beautiful clear blue, and the others are yellow. Amazing colours.

Ho 588. A faintish, closer pair near 39 (4.6). Separation 51".

OΣΣ 207. A fine pair in a crowded field. Magnitudes are 6 and 8, 96" apart.

OΣ 410. This is a rather dim, yellow double separated by 69 seconds.

61. A famous star as being the first to have its distance measured - and it may also possess planets, so an interesting star for several reasons. The binocular observer sees a fine, equal red pair only 25" apart, but not too difficult.

Variable stars

χ (3 - 13). One of the first variable stars to be discovered - by Kirch in 1686. The range given above represents the extreme values we have observed. The maxima, especially, are not consistent, and usually chi will reach magnitude 4. At such times, it will probably be mentioned in astronomy magazines such as *Sky and Telescope* or *Astronomy Now* . The stars η (4.0) and 17 Cyg (5.0) will be useful around times of maximum, which are given here.

W (5.0-7.6) A well-observed object easily found near ρ , with several good comparisons, notably two of 6.1 and 6.7 to the SE.

RS (6.5-9.3) A deep red variable in the "Red Region"; note the little triangle to the N. of 7.3, 7.5 and 9.0. Observation with small bins can be hard due to two rather close companions of 7.2 and 9.0. Observe RS once a month, appreciating its fiery appearance when bright.

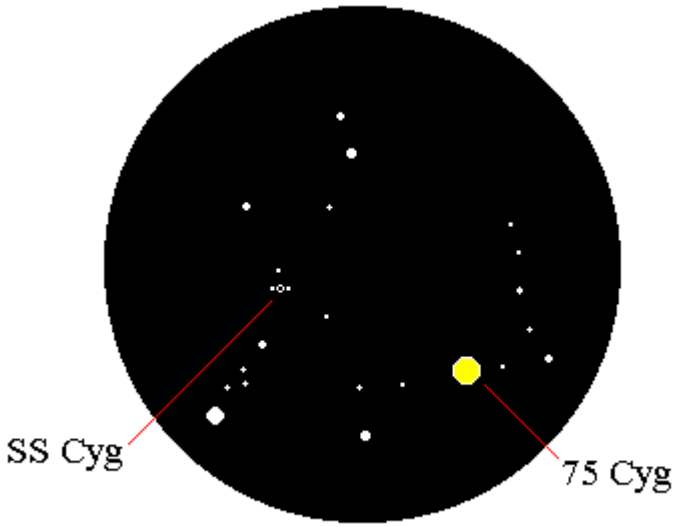
RU (8.4-9.4) Probably too faint for average glasses, but in a fine area.

RV (7.1-9.3) In a small group around the wide pair 79 Cygni. A little triangle just to the South of 7.2, 7.4 and 7.7 comes in useful. Another deep red star.

RW (8.0-9.4) A chart is supplied for this difficult object, yet again red. though not so obvious due to its faintness.

SS (8.0-12) This is the best-observed of the dwarf novae, and I have included it here since you might like to watch the area every night to see when SS pops up inside its

little faint triangle. The diagram here will help you to find it; note the beautiful gold



colour of 75 Cygni.

TT (7.4-8.7) Lying in a crowded area near the famous Mira star chi Cygni, this red star has a small line of three slightly SW whose two fainter members make good comparisons of 7.9 and 8.7.

AB (7.4-8.5) Rather isolated, though a line of three can again be used, their magnitudes here being 7.7, 9.0 and 8.8.

AF (7.4-8.7) Even though I use a 36cm Newtonian reflector to observe faint variables, I still like to follow this star's variations, and certainly those of the next object. It makes a little isosceles triangle with stars of 7.1 and 7.6. It needs observing twice a month and usually gives you an interesting light-curve.

CH (6.0-8.7) A very peculiar star, since a circular issued by the (alas now defunct) Binocular Sky Society called it an " Eclipsing Novalike Semiregular Variable". I was doing a radio phone-in once when, as part of the intro, the presenter referred to "Celestial cannibalism". I was not too clear as to his exact meaning until he showed me the press cutting - CH Cyg had made the national newspapers! Once thought to be a run-of-the-mill red variable, we know now that this star is made up of two components which have evolved differently due to their different initial masses. Gaseous material passes between them which causes dramatic light changes from time to time. In 1968-69 this star brightened to magnitude 6, whereas in the late '80s and the early '90s it faded beyond its official limit to magnitude 9.2. An ever more drastic fall took place two or three years after that, when it fell even farther to magnitude 10, way beyond its official range. A really fascinating and important star which you need to look at from one night to the next, recording times to the nearest minute.

V367 (7.1-7.7) An eclipsing binary with some good comparisons in the form of three stars to the W of 6.3, 6.4 and 6.8 and another of 7.9m to the North.

V449 (6.3-7.1) Found by locating two bright stars of 6.1 and 6.4 which point to a line of three. This is the one in the middle. A further star of 6.9 lies to the SE.

V460 (6.1-7.0 A red variable, with a useful star of 6.6 to the NE.

V485 (7.2-9.0) Halfway between this star and eta Cyg you can find three objects of (N to S) 8.2, 8.1 and 7.9. Another red variable.

V973 (6.2-7.0) An easy binocular variable, if of rather small range. One of a trapezium whose other members are of magnitudes 6.1, 6.7 and 6.9.

V1070 (6.7-7.7) Another good star to observe. It makes an equilateral with 6.2 and 6.5m stars, and two comparisons of 7.2 and 7.4 lie to the S.

V1339 (5.9-6.5) This used to be used as a comparison for the nearby W Cygni until observers discovered its variability. Use the stars under W for this one.

V1500 (2.1-?) The strange Nova discovered by Honda in 1975, as well as by others (including the author). It was peculiar because of its very large range; most Novae have amplitudes of about 12 or 13 magnitudes but V1500 rose rapidly from below magnitude twenty right up to the second magnitude!

Clusters and Nebulae

NGC 6866. A cluster seen as a diffuse oblong patch.

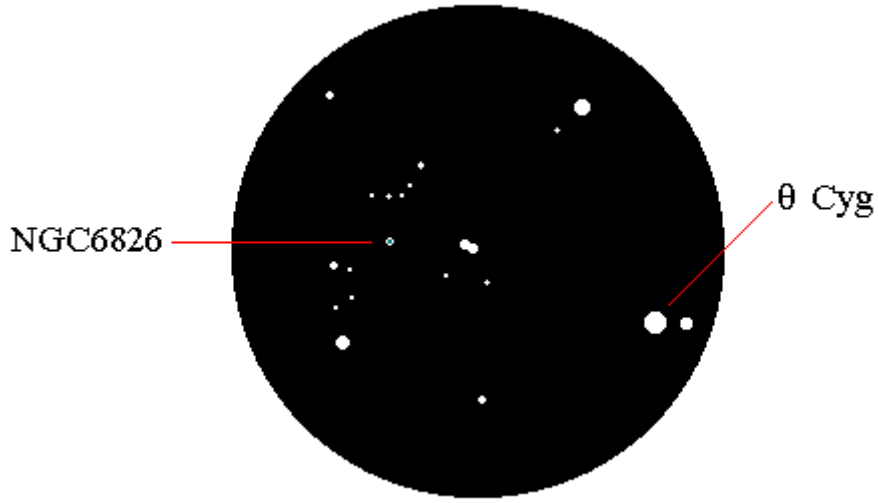
NGC 6910. A misty spot near γ in a superb field.

M.39 (NGC 7092) Visible with the eye as a brightening of the Milky Way, even the smallest bins reveal several stars. With 10x80, over twenty stars are visible. Telescopes are no good here as they have too small a field to give a good view.

NGC 7000. The *North America Nebula*, so called for its amazing resemblance to that landmass. Sandor Toth using 10x80s says "easy... hazy edges... brighter to the South and in the centre". A clear dark sky is an absolute essential for this nebula. The more elusive, and again well-named, *Pelican Nebula* close by has been seen with 10x80s.

NGC 6883. An open cluster, with three distinct stars seen with 8x30s.

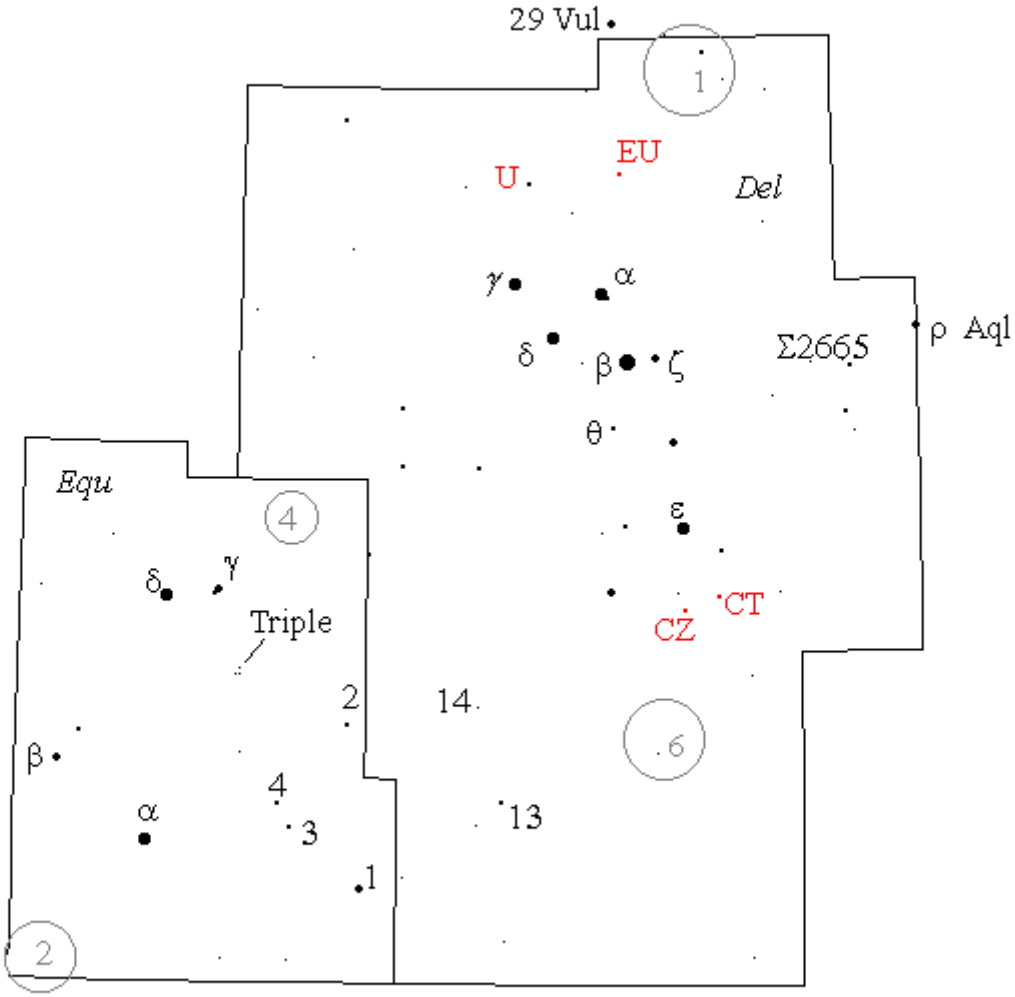
NGC 6826. A planetary nebula in a fine area, for which you can use the chart here



. Telescopes show a central star, about whose magnitude there has been some dispute., and the appearance of the star and nebula is such that when one looks at the star with a small telescope, the nebula becomes less distinct, and vice versa. For this reason it has become known as the "Blinking Nebula", though the two will not be separately seen with ordinary binoculars.

DELPHINUS

Chart



A small but distinctive group near the Milky Way. Many fine fields and some good variable stars. However, one of the most peculiar things about Delphinus is that its leaders, α and β, have the peculiar names of *Sualocin* and *Rotanev*. Antiquarians anguished over their etymology until wise old Rev.Webb pointed out that they spelled *Nicolaus Venator* backwards, the latin version of the name of an assistant at Palermo observatory, Niccolo Cacciatore. (Or in English, Nicholas Hunter)

Groups of stars

1. Beautiful group, lying just west of 29 Vulpeculae (4.8).

2. 20h 40m, +19°. Small, square asterism. A pretty group with small glasses.

3. ε (4.0). Sweep from this star towards θ.

4. ρ Aquilae (5.0). A beautiful field of faintish stars just East of this object.

5. 13 and 14. Part of a large quadrilateral. 14 is a wide pair.

6. 20h 32m, +6°. Beautiful collection of 13 stars somewhat like the greek letter Σ.

Wide doubles

Σ2665. A member of group (4). Mags are 6.9 and 7.2.

β. Note the tiny triple to the Northwest.

θ. Small wide triple E. A degree NE of this is a wide pair, while south of this is a small curve, of which the northern star is double. Directly East again is another close pair.

Variable stars

U (5.6-7.5) A well-loved red variable, with two useful stars of 6.3 and 6.8 between it and alpha Del.

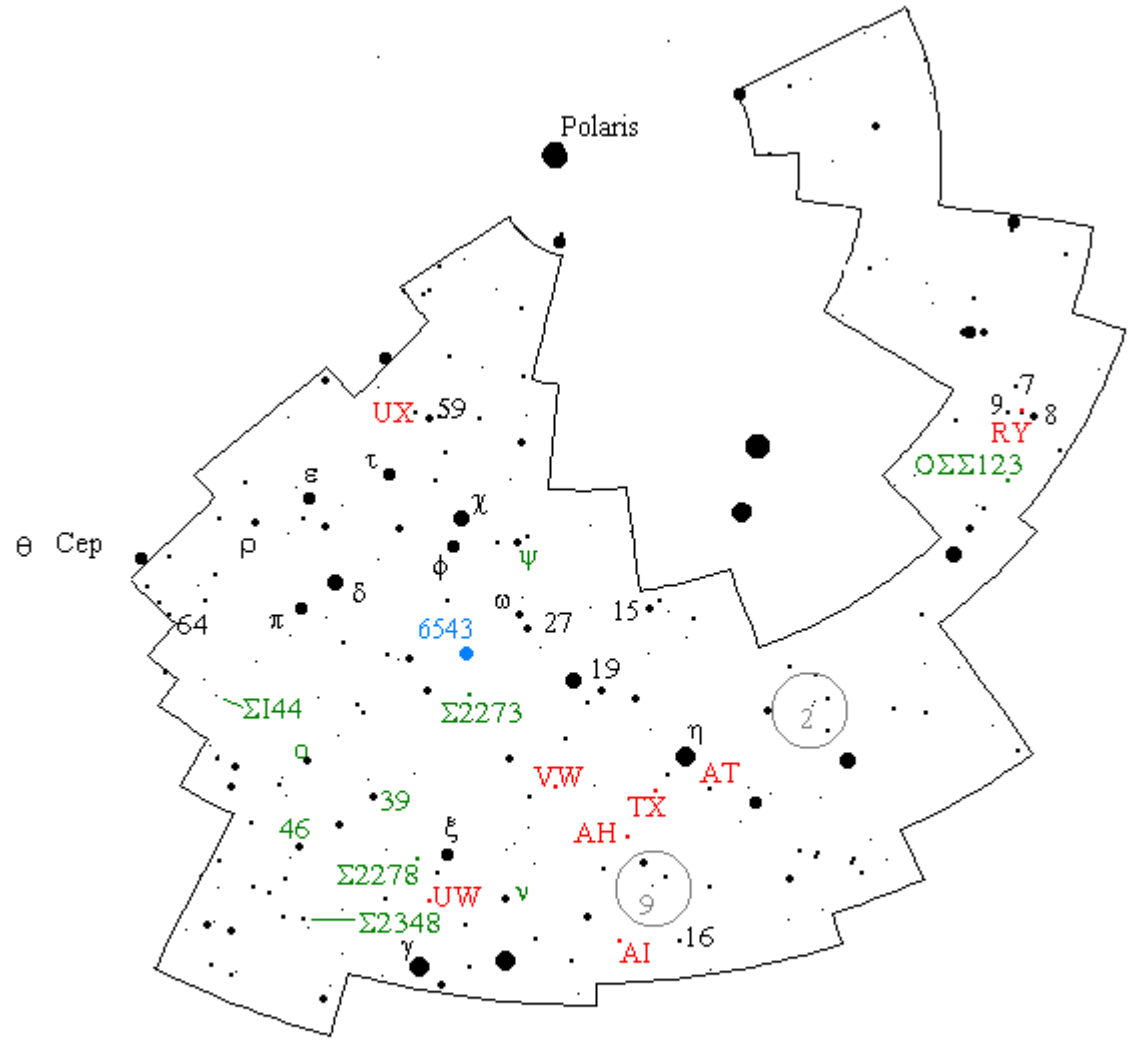
CT (7.7-8.2) A red star with a rather small range for visual observers; but you can at least see when it is brighter or fainter than the 8.0m star to its Southeast.

CZ (7.8-9.0) This is one of a wide triple, whose most distant member is to the northwest and is of 8.7 magnitude.

EU (6.0-6.9) A well-followed red variable near U, whose comparisons can be used here as well.

DRACO

Chart



A long and rather dull group to the eye, but full of good fields and interesting objects for the binocular owner, especially in its Eastern borders.

Groups of stars

1. Bright triangle of 7 (5.7), 8 (5.3) and 9 (5.5) which also contains the red variable RY Draconis.

2. 15h 25m, +62°. A long, bright diamond.

3. Large trapezium that includes 15 Dra (5.0).

4. 27 and ω. A region of many bright stars to the binocular lenses.

5. χ. Fine sweeping in this area.

6. Brilliant groupings around 64 and 66 towards θ Cephei.

7. Fine, prominent group of delta, pi, epsilon and rho.

8. Large pentagon, including the bright stars χ, ϕ and tau.

9. 15h 44m, +55°. A fine region of several bright stars. Good for small glasses.

10. Sweep around the "head" of Draco; an area of many small stars.

11. γ. The brightest star in Draco is the guide to a fine sweeping area, especially to the East.

Wide doubles

η. This has a companion, itself a close double, just to the North.

19. With 20, forms a striking object for small bins.

16. Similarly forms a good object with 17, of the same brightness.

Close doubles

OΣΣ 123. A lovely yellow and blue double.

ν. Said to be just splittable with the naked eye, binoculars show this to be a fine equal double.

ψ. Another good binocular pair. The colours are yellow and lilac and the separation is 31 arc-seconds.

Σ2273. A close (21") pair of the 7th magnitude. Use large glasses here.

Σ2278. Similar magnitudes, but wider at 39".

39. Rather difficult; mags 5 and 8, distance apart 89".

Σ2348. A hard pair of differing colours, and close at only 26 seconds.

46. A star with an attendant on each side.

o. This star has an eighth-magnitude *comes* thirty seconds away.

ΣI 44. A lovely gold and blue pair 77" apart. Note a faint foursome 1° to the west.

Variable stars

RY (6.7-8.0) Easy to find, this deep red star needs looking at once every three weeks. Use the stars in group (1) to estimate it when bright.

TX (6.8-8.3) Another easy star, one of a trapezoid near eta. There are two comparisons on either side, 7.2 and 7.9.

UW (7.0-8.0) A small right-angle just east of ξ (7.2, 7.5 and 7.8) is perfect for this star, which is orange instead of the usual red.

UX (6.2-6.9) One of the reddest stars in the sky, so beware how you estimate it. It lies near the star 59 Dra, on the other side of which is a good comparison of 6.5m.

VW (6.0-6.5) Quite difficult with small glasses because of a close companion of 6.7m. Like UW above, this is an orange variable.

AH (7.1-7.9) Another double, but rather wider. The attendant is South of AH, and is of magnitude 7.3.

AI (7.1-8.1) This eclipser makes a right-angle with two other stars of 7.1 and 7.7 that lie between it and μ.

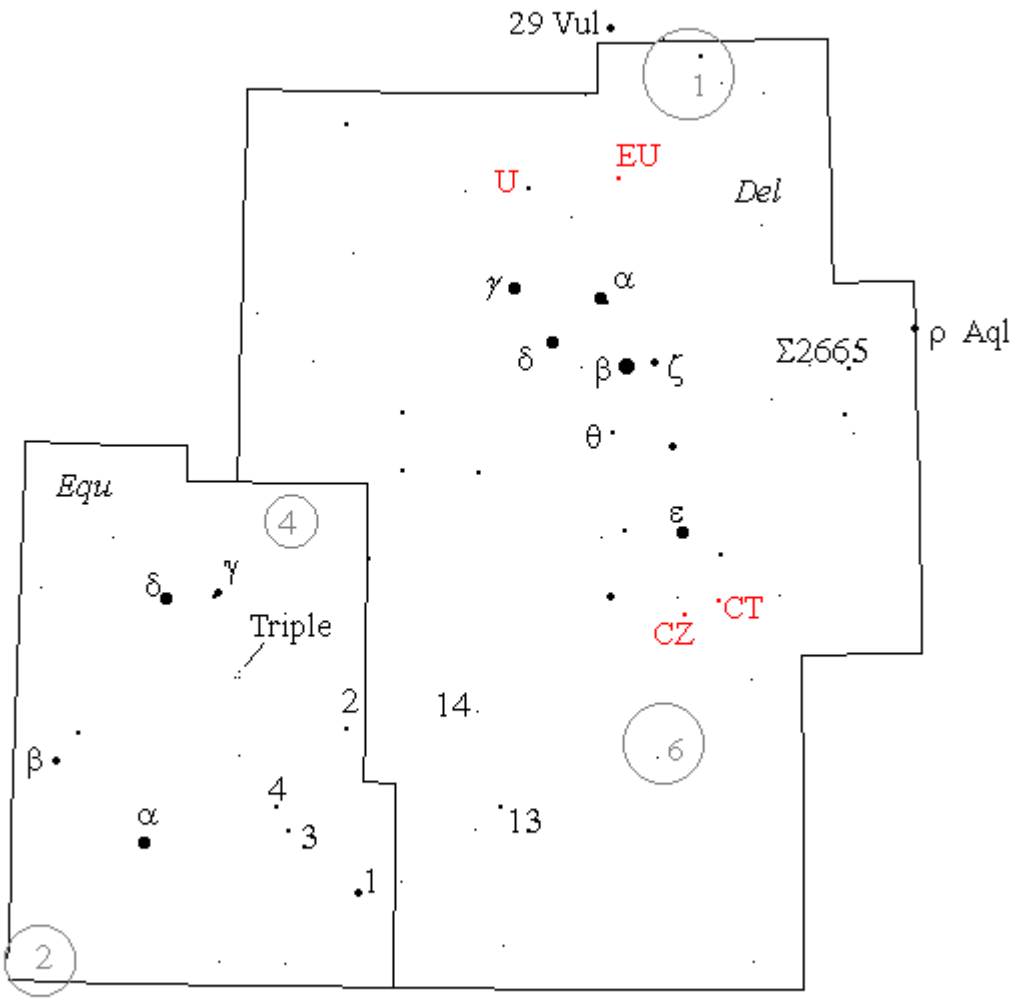
AT (5.3-6.0) A bright star, well-suited to small glasses and lying halfway from η to θ.

Clusters and Nebulae

NGC 6543. A small but quite bright planetary nebula, with a wide pair 1°SE. Use the chart here to find it.

EQUULEUS

Chart



A small group with little to offer, figured in pictorial star-maps as not so much a Horse as a nag's head!

Groups of stars

1. Large, fine group with attractive sweeping SE. It includes 1, 2, 3 and 4.

2. 21h 20m, +3°. Beautiful little group (6.6,7.3,7.4,7.6).

3. δ (4.6). Good sweeping to the N and NE.

4. 21h 00m, +13°. Small arc of eight faint stars.

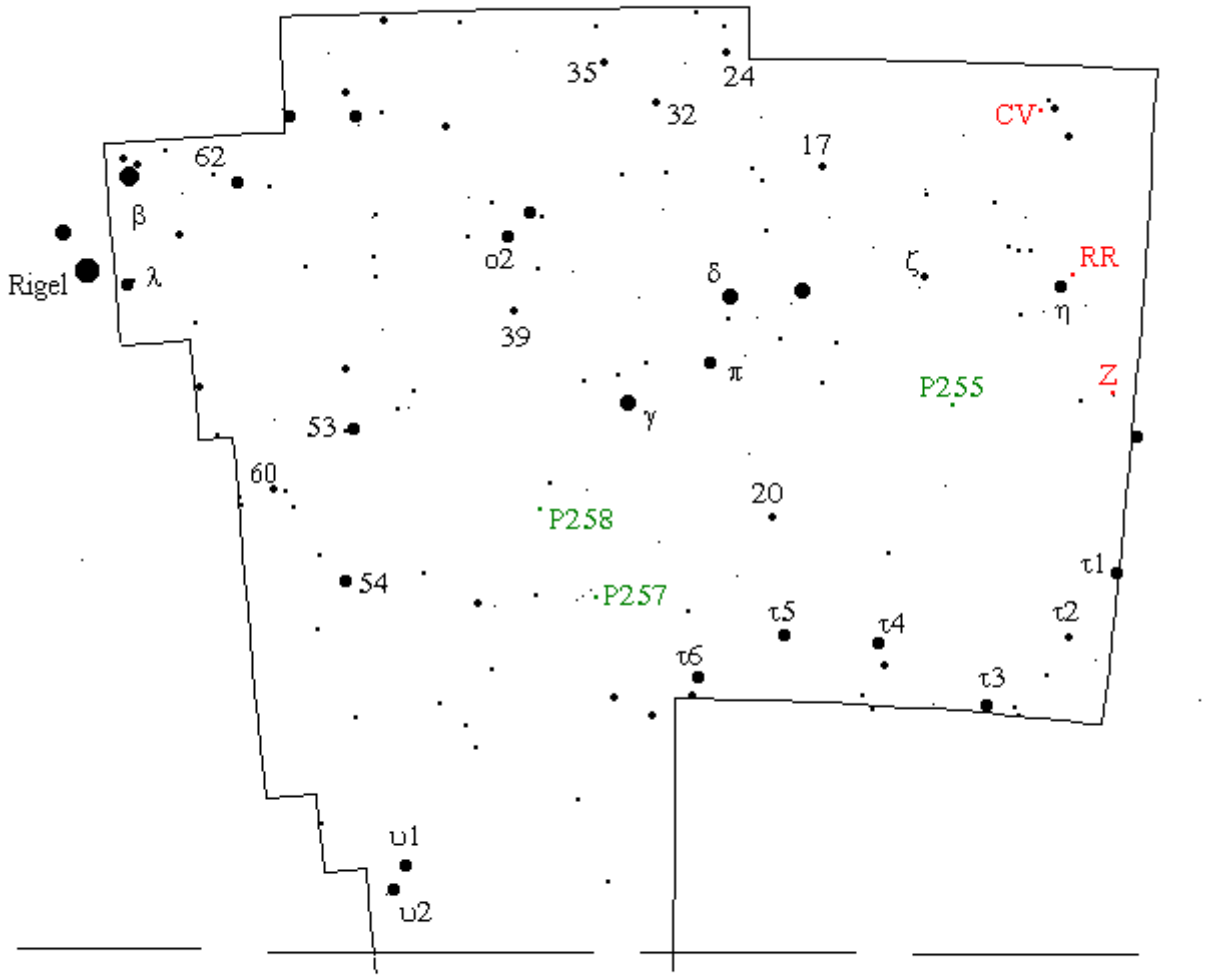
Wide doubles

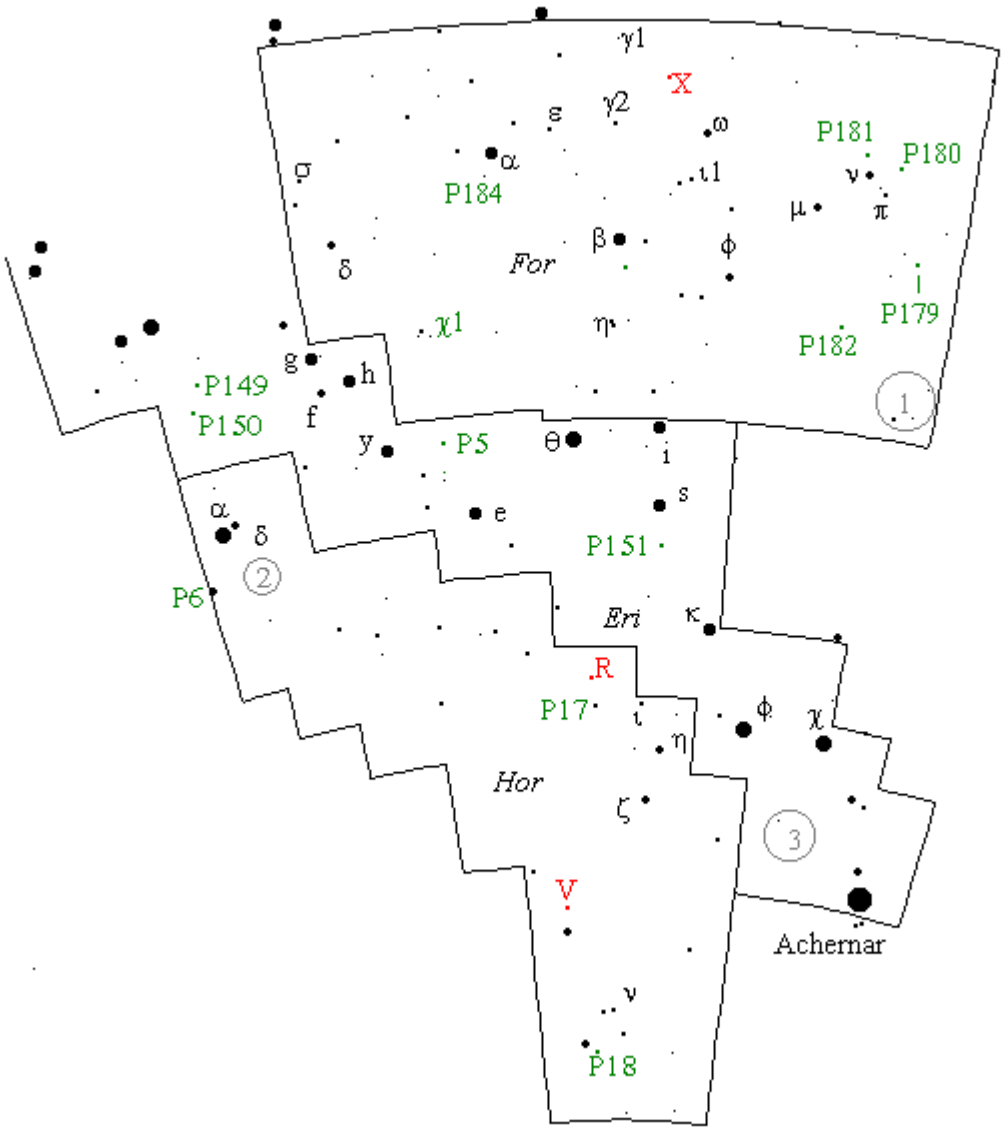
21h 07m, +07°30'. Small triple with an orange star of 6.4m to the S. A degree to the east is another wide pair of 7.2 and 7.4.

γ and 6. An easy wide pair of 4.8 and 6.0m.

ERIDANUS

Chart





A huge constellation with relatively few bright stars. Some of its length is too far South to be seen from most Northern countries, and is treated under the Southern groups.

Groups of stars

1. Bright triangle which includes the red variable CV Eri.

2. η, δ and 17. Sweep around these stars.

3. Large group, including 24 (5.1), 32 and 35.

4. o^2 and 39. Another area worth perusal.

5. Sweep the area bounded by Rigel, λ and β Eridani.

6. 60 (5.2). A region of numerous faint stars.

Wide doubles

ζ This 4.9m star has a neighbour of 6.8. Forms a pair also with 14.

β. A star with two bright associates, 66 and 68. Attractive in small binoculars.

τ^6. Between this star and γ is a fine wide pair of 6.4 and 6.6.

π Between this and 20 (5.3) is another pair, rather wider.

Close doubles

62. An easy object with a distance of 66". A is yellow.

P.255 Good for medium glasses, with mags of 7.2 and 8.4 and 145" apart.

P.257 This rather dim pair of 8.0 and 8.3 lies in a pleasant area.

P.258 Another faintish pair. Distance 122".

Variable stars

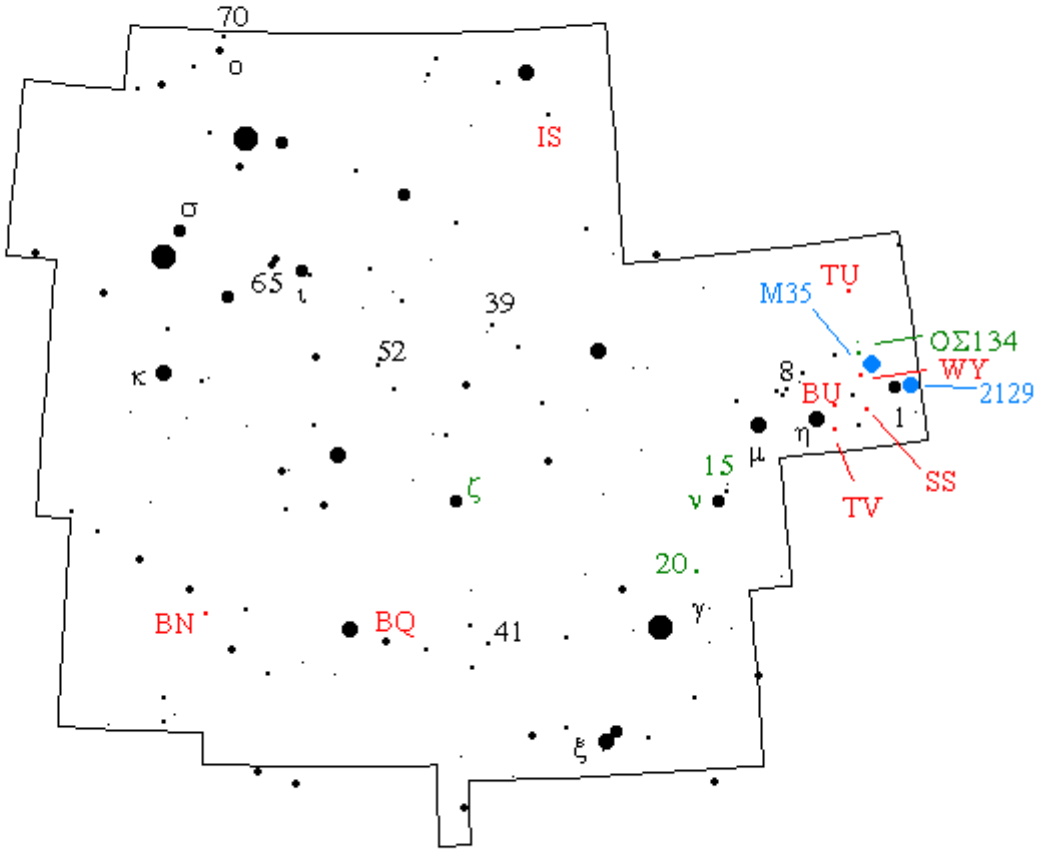
Z (5.6-7.2) This red star is one of a parallelogram whose remaining members are of 6.1, 7.2 and 7.5m.

RR (7.0-8.0) Another red variable, two stars of 7.2 and 8.0 lying to the North-east, and making useful comparison stars.

CV (6.3-6.9) This is one of group (1) and is rather isolated.

GEMINI

Chart



A brilliant constellation with many striking Milky Way fields. Castor is a famous multiple star made up of no less than 6 components, though none are visible with bins. Gemini, as a constellation, has always been associated with a pair of something - whether Kids (Chinese) Boys (Greeks) Peacocks (Arabs) or Angels (some renaissance artists!)

Groups of stars

1. Long bright Y formed by ι, 59, 64 and 65.

2. Smaller, more regular Y between sigma and iota.

3. Large, bright arc near Castor, includes 70 and o.

4. Sweep from the red star 1 (4.3) to eta and mu , also red stars.

5. γ. Good sweeping from here towards Orion.

6. 41 (5.6), has beautiful clouds of faint stars to the S.

7. Tiny groups of faint stars also around 52 (6.0).

Wide doubles

39 and 40. A bright pair, with the latter a close double. There are two fainter and closer pairs 1° SE.

8 and 9. Two 6m stars with a bright triple (10, 11, 12 Gem) south.

ξ This star has two bright companions.

κ Directly West is a wide pair of 6.0 and 6.3.

Close doubles

OΣ 134. One of a small triangle. Distance 31 arcseconds.

ν An unequal but fairly easy pair (113") that makes a wide triple with 16 and 15. The latter is also double (6.5,8.0; 30").

20. This equal pair is quite close but is in a superb field.

ζ. A fine binocular object, distance 94".The primary is a bright Cepheid variable.

Variable stars

SS (8.5-9.5) Owners of large glasses can follow this RV Tauri star by using the chart provided. Observe once a week.

TU (7.4-8.3) A red semi-regular, one of a trapezium.

TV (6.6-8.0). Near the star eta Geminorum in a field containing several red stars, which are shown on the finding chart here.

WY (7.2-7.9). See under TV.

BN (6.0-6.6) A white variable not far from λ. The 6.3m 67 Gem is a good comparison.

BQ (5.1-5.5) The smallest of glasses will show this star, which like the previous object has rather too small a range for visual observation - though you can use 45 Gem (5.6) and 41 (5.8) nearby.

BU (6.1-7.5) 8 and 9 Gem (6.1 and 6.3 respectively) are useful when this star is near maximum.

IS (5.3-6.0) Like BQ, suited to small glasses. SE of the nearby θ is a good comparison star of 6.0m.

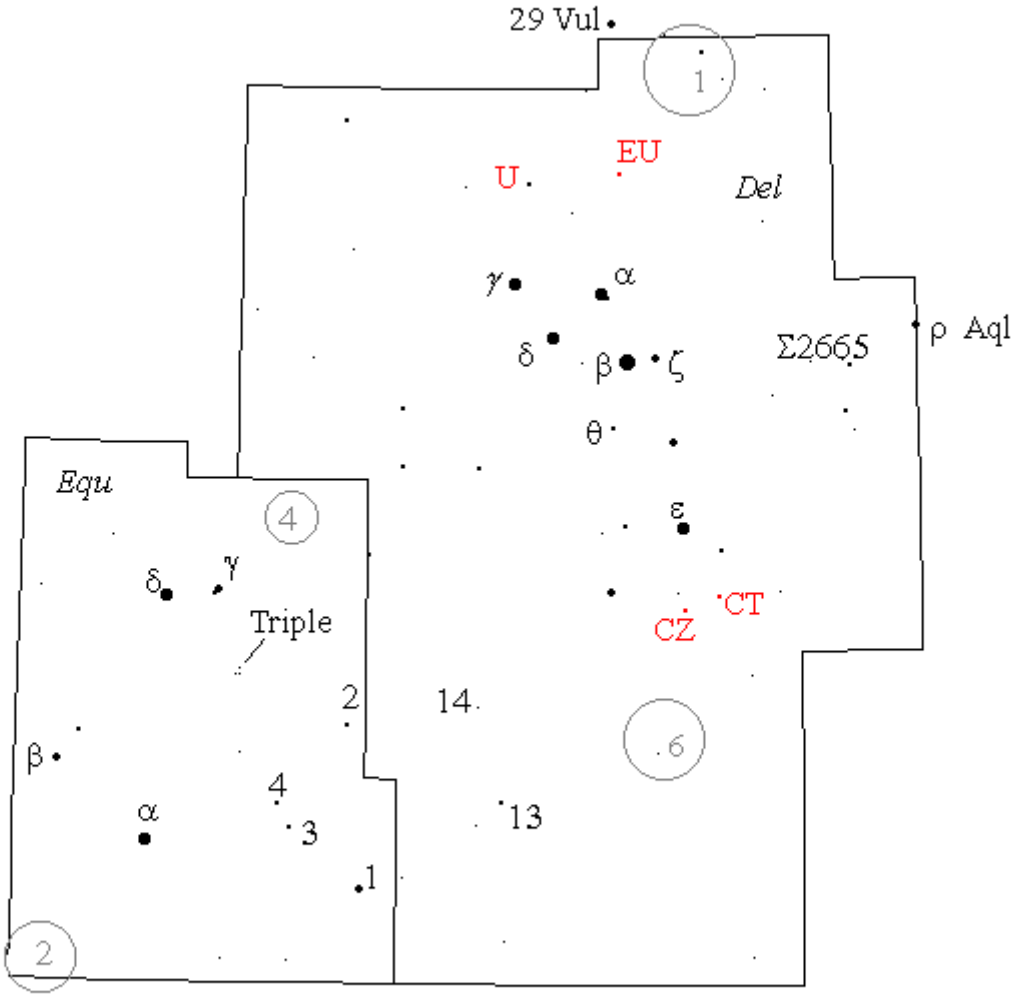
Clusters and Nebulae

M.35 (NGC 2168). A magnificent sight in a telescope, and by no means disappointing in bins either. Anything larger than 8x30 will show some stars, superimposed upon a glowing gleam.

NGC 2129. Easily found near 1 Gem, large binoculars may reveal a few stars, though observers in this area tend to be more attracted by M.35!

DELPHINUS

Chart



A small but distinctive group near the Milky Way. Many fine fields and some good variable stars. However, one of the most peculiar things about Delphinus is that its leaders, α and β, have the peculiar names of *Sualocin* and *Rotanev*. Antiquarians anguished over their etymology until wise old Rev.Webb pointed out that they spelled *Nicolaus Venator* backwards, the latin version of the name of an assistant at Palermo observatory, Niccolo Cacciatore. (Or in English, Nicholas Hunter)

Groups of stars

1. Beautiful group, lying just west of 29 Vulpeculae (4.8).

2. 20h 40m, +19°. Small, square asterism. A pretty group with small glasses.

3. ε (4.0). Sweep from this star towards θ.

4. ρ Aquilae (5.0). A beautiful field of faintish stars just East of this object.

5. 13 and 14. Part of a large quadrilateral. 14 is a wide pair.

6. 20h 32m, +6°. Beautiful collection of 13 stars somewhat like the greek letter Σ.

Wide doubles

Σ2665. A member of group (4). Mags are 6.9 and 7.2.

β. Note the tiny triple to the Northwest.

θ. Small wide triple E. A degree NE of this is a wide pair, while south of this is a small curve, of which the northern star is double. Directly East again is another close pair.

Variable stars

U (5.6-7.5) A well-loved red variable, with two useful stars of 6.3 and 6.8 between it and alpha Del.

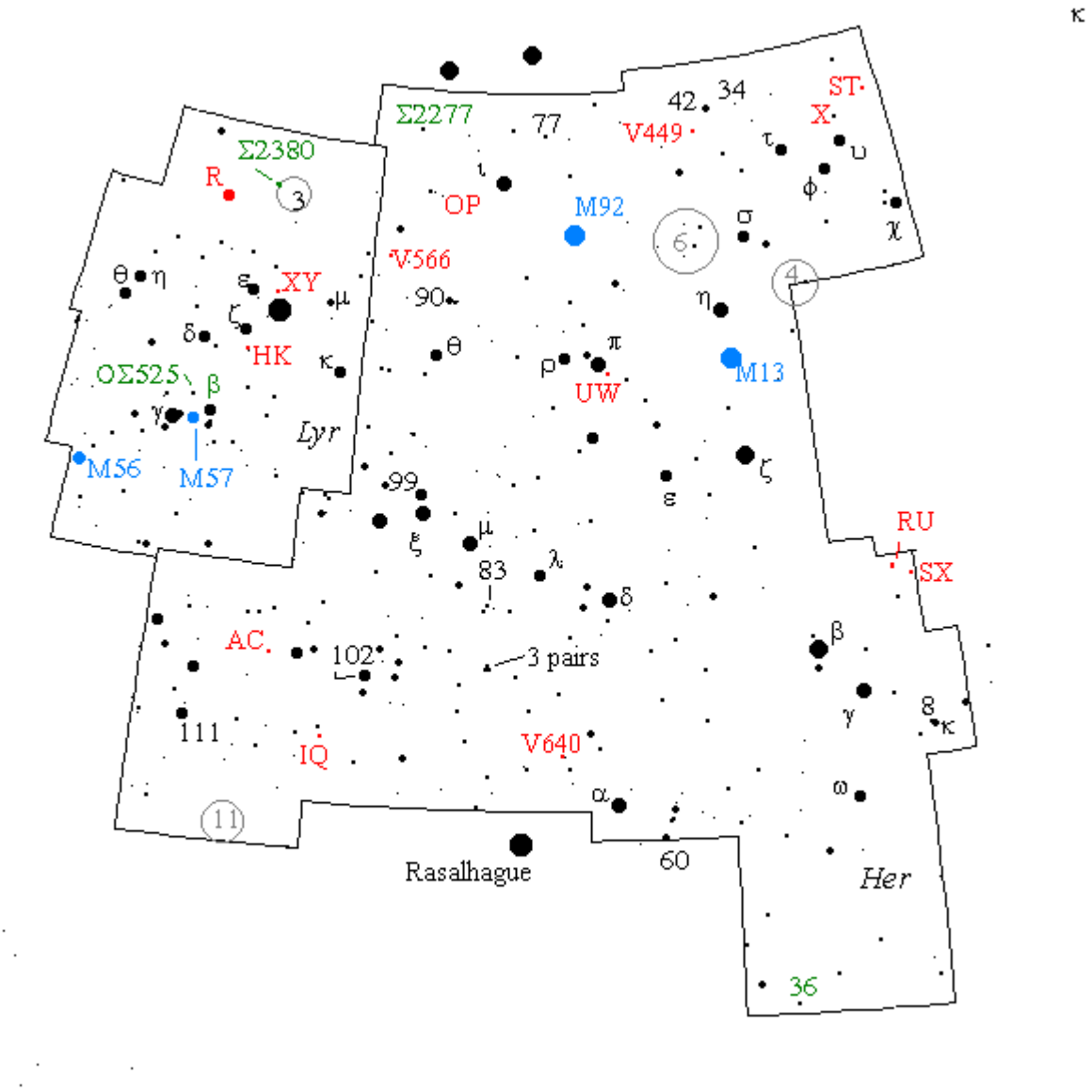
CT (7.7-8.2) A red star with a rather small range for visual observers; but you can at least see when it is brighter or fainter than the 8.0m star to its Southeast.

CZ (7.8-9.0) This is one of a wide triple, whose most distant member is to the northwest and is of 8.7 magnitude.

EU (6.0-6.9) A well-followed red variable near U, whose comparisons can be used here as well.

HERCULES

Chart



A magnificent group brimming over with interesting objects including two notable globulars. It also contains the point in the sky towards which the Sun, along with the Solar system, is heading (the *apex*). Most old depictions of Hercules show him, for some reason, upside down; so it comes as no surprise to learn that the name of its leader, *Rasalgethi* , means "head of the kneeler" even though it lies at the foot of the constellation.

Groups of stars

1. The 4th-mag group of τ, ϕ, υ and χ. The latter has two neighbours, 2 and 4 Her, of contrasting red and blue colours.

2. 34 (6.2). Interesting sweeping to the S.

3. Range around ι (3.4) towards the head of Draco.

4. 16h 12m, +40°. Curved, inverted Y of 6th- and 7th-mag stars.

5. Large graceful curve of bright stars from ε to ρ.

6. 16h 50m, +43°. Beautiful collection of 6m stars.

7. Splendid group including xi and 99.

8. Beautiful group that includes 60 Her (4.9).

9. Another bright group, on the other side of Rasalgethi, that includes the small-range red variable V640.

10. Marvellous bright collection around 102 (4.3). This star used to be part of a now-redundant constellation called *Ramus Pomifer* , the apple branch, no doubt depicting the Apples of the Hesperides that our hero went in search of.

11. 18h 40m, +12°. Pretty line of four stars (7.0, 7.3, 7.9, 8.3).

12. Another magnificent group that includes 111 (4.4).

Wide doubles

42. A 5.1m star with a fainter associate. 2°S. is another wide pair.

77. A star with two fainter companions.

90. Another bright object, this time with 3 neighbours.

60. Note the wide double of 5.9 and 6.1 to the N.

8 and κ Magnitudes 5.3 and 6.1. The latter is a closer double.

83. A star with three bright companions.

17h 40m, +22°. Three wide pairs together.

Close doubles

κ A difficult pair; magnitudes 5 and 6, 31" apart.

γ. Slightly wider, but less equal in brightness.

36. This easy double has another pair to the SW.

Σ2277. A tricky pair in a fine field. Mags 6 and 8, distance only 28".

Variable stars

X (6.4-7.4) A well-known red variable, with a companion of 7.4. There is another good star of 6.6m a degree east.

ST (7.0-8.7) Also in the far North of Hercules, this makes a diamond with three other stars of 8.4, 8.6 and 8.8.

SX (8.0-9.2) A fainter, yellow variable, this has an equilateral triangle of 7.2, 8.4 and 9.0 to the East. Two other variables are nearby - RU, a Mira star reaching mag.7 at maximum, and LQ, a small-amplitude red star, unsuitable for visual observing.

UW (7.5-8.6) Another yellow-orange variable, but of smaller range.

AC (7.0-9.0) This is one of the most rewarding binocular stars I know of, since it always seems to be doing something! Observe it once a week, as it is an RV Tauri star with quite a short period. A chart should be downloadable from the AAVSO.

IQ (7.3-8.2) There are several 7m comparisons close at hand for this red star, which is not too far from the preceding variable.

OP (6.0-6.6) One of a line of three (the others are 5.7 and 6.4m) which you will be able to pick out by its redness.

V566 (7.1-7.8) Again one of a line of three; the two stars to the South of it are 7.9 and 8.2m. A good star to observe,though with a fairly small range.

V449 (8.0-9.0) This underobserved star lies between two stars of 8.0 and 9.0, and a 6.6m one lies just to the E.

V640 (5.7-6.3) One of group (9). The other members are 5.2, 5.7, 5.9 and 6.2. See if you can work out which is which - a good exercise in estimating magnitudes.

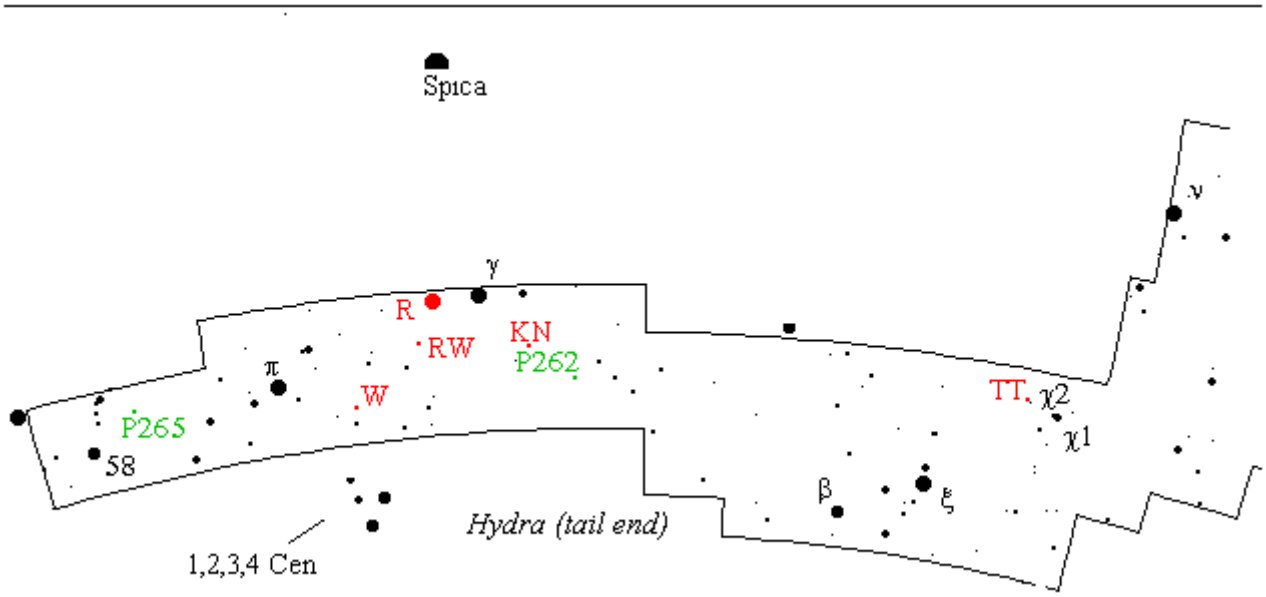
Clusters and Nebulae

M.13 (NGC 6205). The famous Hercules globular cluster betrays a sizeable disc in binoculars, the bigger the better - though of course you won't be able to see its individual members, as high magnification is needed. Two 7m stars close by make recognition easy.

M.92 (NGC 6341). Though slightly dimmer and smaller than M.13, this one is still worth finding, even if it is in a more out-of-the-way area.

HYDRA

Chart



This largest of the constellations contains several interesting variable stars though little else. Of the many constellations which sit on its coils, two have since been dismissed from the lists. These are *Noctua* and *Felis* otherwise known as the Owl and the Pussycat. I think their demise is rather a shame.

Groups of stars

1. Sweep the head of Hydra; some fine areas.

2. τ^2 . Interesting area to the SE.

3. Alphard. Beautiful sweeping around this fine orange star.

4. λ (3.8). Another region that rewards careful examining.

5. C (4.1). This forms a fine group with 1, 2, and other fainter stars.

Wide doubles

23. A star with two fainter attendants.

27. Note a 6m star close by. Can you see any colour here?

37. Two degrees West is a similar pair.

χ^1 This makes a fine wide pair with χ^2.

Close doubles

Σ1255. A test object; mags 7 and 8, distance 27".

P.260 A pretty pair of 5.9 and 7.1, both orange. Distance 67".

P.262 This is the western member of a little lozenge-shaped group of 5m and 6m stars. Separation is 150" and mags are 7.6 and 8.4.

P.265 A difficult pair in a fine area. Mags 6.9 and 8.4, 71" apart.

Variable stars

R (4.5-10) This was one of the first variables to be discovered - in 1704 by Maraldi. It is also interesting in that its period has decreased in these 300 years from 500 days then to about 400 days now. A very red star, for which predictions are provided.

U (4.8-5.8) An easy variable inside a wide trapezium of 5.5, 5.9, 5.9 and 6.3.

W (6.0-9.7) The best guides to this star are 1, 2, 3 and 4 Centauri. Come 4° North and you will find two stars of 6.1 and 6.3 with which W forms an isosceles triangle. When bright, this star is easy, but it has a close 9th-mag companion which needs a telescope for proper estimates to be made. Note a useful little line of 8.2, 8.4, 8.9 and 8.7 just S of the 6.1m star.

Y (6.9-7.9) This is one of a large Y (others are 6.3, 7.2 and 6.1). A red variable.

RV (7.5-8.7) Rather isolated, thisforms the SW corner of a diamond whose other stars are of 6.5, 6.8 and 7.2. RV itself has a neighbour of 8.7m.

RW (8-9) A reddish "symbiotic" variable, which should not be confused with an 8.4m star closely NE, though this is a good comparison star. The variations of this star are usually small, however.

TT (7.4-9.2) An eclipsing binary making an equilateral with two stars of 6.5 and 8.4m. Its period is about one week.

FF (6.8-8.5) The two stars of 5.9m (see U Hya above) sandwich a 6.9m object. Closely N. is a 6.5m star near a wide pair of 8.2 and 8.8. A red semi-regular variable.

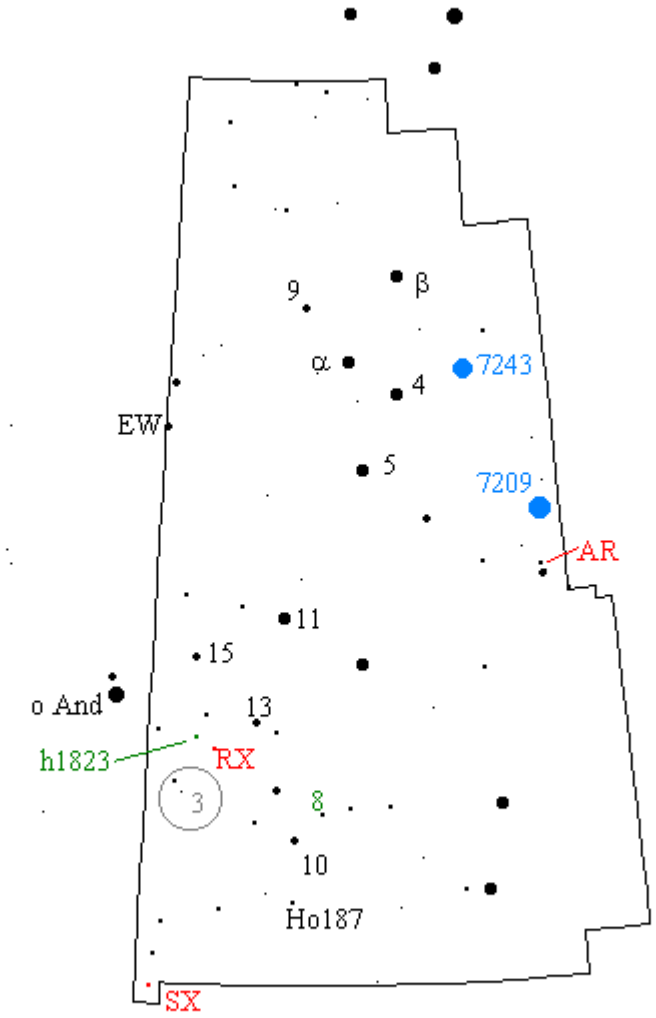
KN (7.0-9.5) A chart is given for this Mira variable.

Clusters and Nebulae

M.48(NGC 2548). A cluster marked by a few faint stars.

LACERTA

Chart



Although a small constellation, Lacerta is supplied with many beautiful fields, as it lies in a rich region of the Milky Way.

Groups of stars

1. Large bright group of α, β, 4 and 9. A fine sight, with a wide, 7m pair between the two first stars.

2. A beautiful line of bright stars linking 9 with EW (5.0-5.3).

3. 22h 51m, +40°. Brilliant group around a wide double.

4. 10 (4.9). Some magnificent groups to the S.

5. Sweep the triangle bordered by 11, 13 and 15.

Wide doubles

Bright wide triple (5.3, 6.2, 6.4) southwest of the variable AR Lac (5.9-6.7).5 (4.6). Note the tiny quadruple closely SW of this orange star.

Ho.187. A faint telescopic pair. Note a wide triple just S, and a small faint arc W

Close doubles

8. Good glasses show one, perhaps two, companions.

h1823. Easy; magnitudes 6 and 7, distance 82".

Variable stars

RX (7.5-9.0) A red star in a fine region, and with two useful stars nearby of mags. 7.7 and 8.7. The latter lies closely NE.

SX (7.7-8.7) This lies in a crowded area between two stars of 7.0 and 7.2. It also forms a south-pointing equilateral with 8.1 and 9.0m objects.

AR (5.9-6.7) The triple mentioned under "wide doubles" is useful for this eclipsing binary.

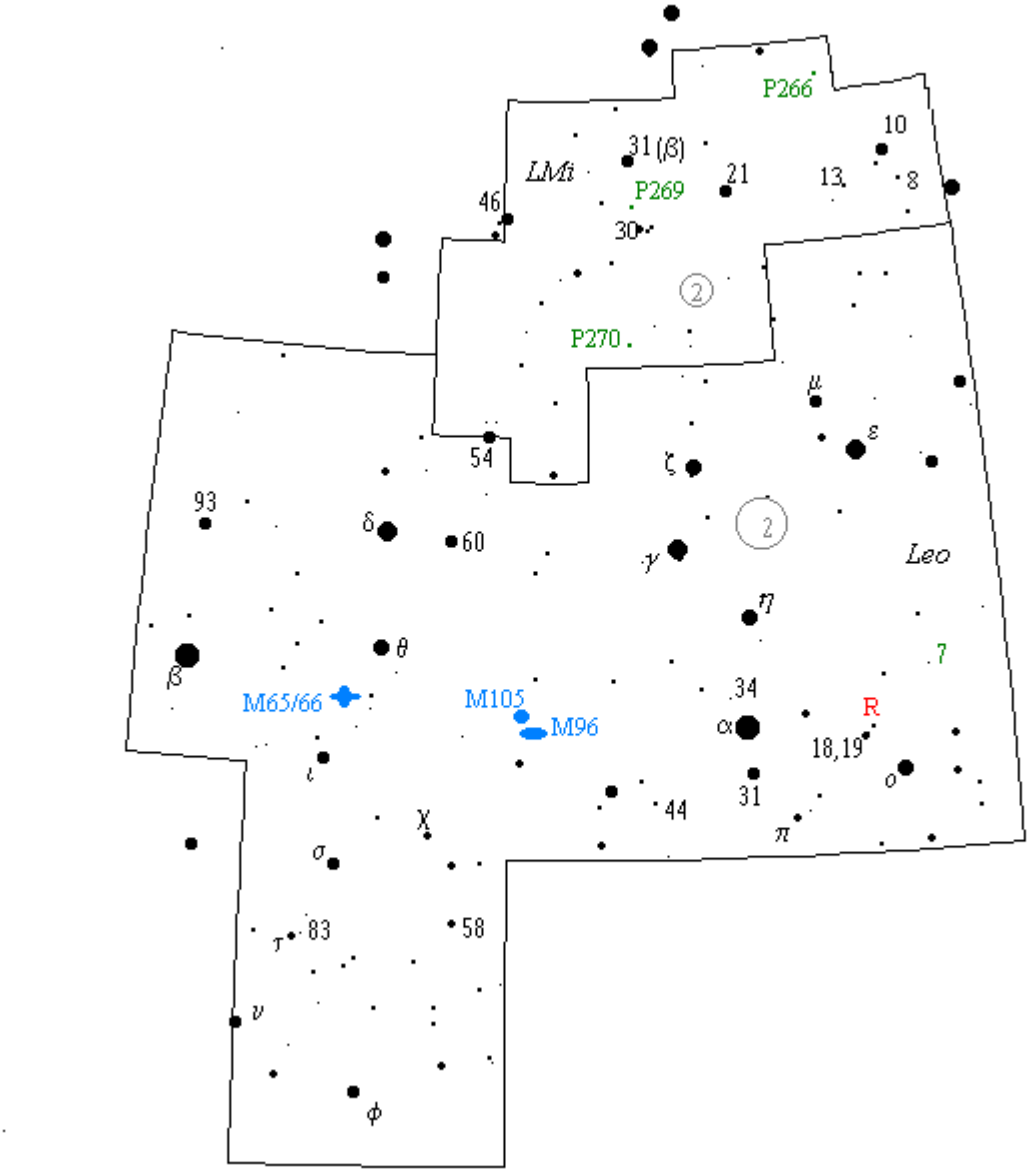
Clusters and Nebulae

NGC 7209. A fine cluster, in which a few stars before nebulosity appear using 7x50 binoculars.

NGC 7243. The same calibre of glasses will show a fine, large star-group containing between ten and fifteen stars.

LEO

Chart



A magnificent group containing several good doubles and fine fields, considering its distance from the plane of the Galaxy.

Groups of Stars

1. Note faint collections of stars between ε and μ.

2. 10h 05m, +22°. A 6m star surrounded by many fainter ones.

3. ο (3.8). Interesting sweeping, particularly W.

4. δ and β . Fine region between these bright stars.

5. Brilliant area which lies inside φ, υ, τ and 58.

Wide doubles

ζ . This has two fainter companions. Nearby gamma (Algieba) also has a fainter attendant in 40.

18. A 5.9m star that makes a pair with 19. When R Leonis nearby is at maximum, the three together make a good show in small glasses.

34. This has a fainter star close by.

44. A wide coloured pair of 5.9 (red) and 7.7 (yellow).

β 2°N. is a wide pair of 6.0 and 7.0.

τ and 83. Each member of this wide pair is actually a binocular double.

Close doubles

α . Owners of good, large glasses might like to try Regulus, when feeling in a hopeful vein. Difficult due to the magnitude difference, but wide at 177". Mags 1 and 8.

83. A fine close pair of 30". The colours have been said to be yellow and lilac. Close by is τ, wider, though slightly fainter.

7. An easy to find, though rather faint pair. Separation is 42".

Variable stars

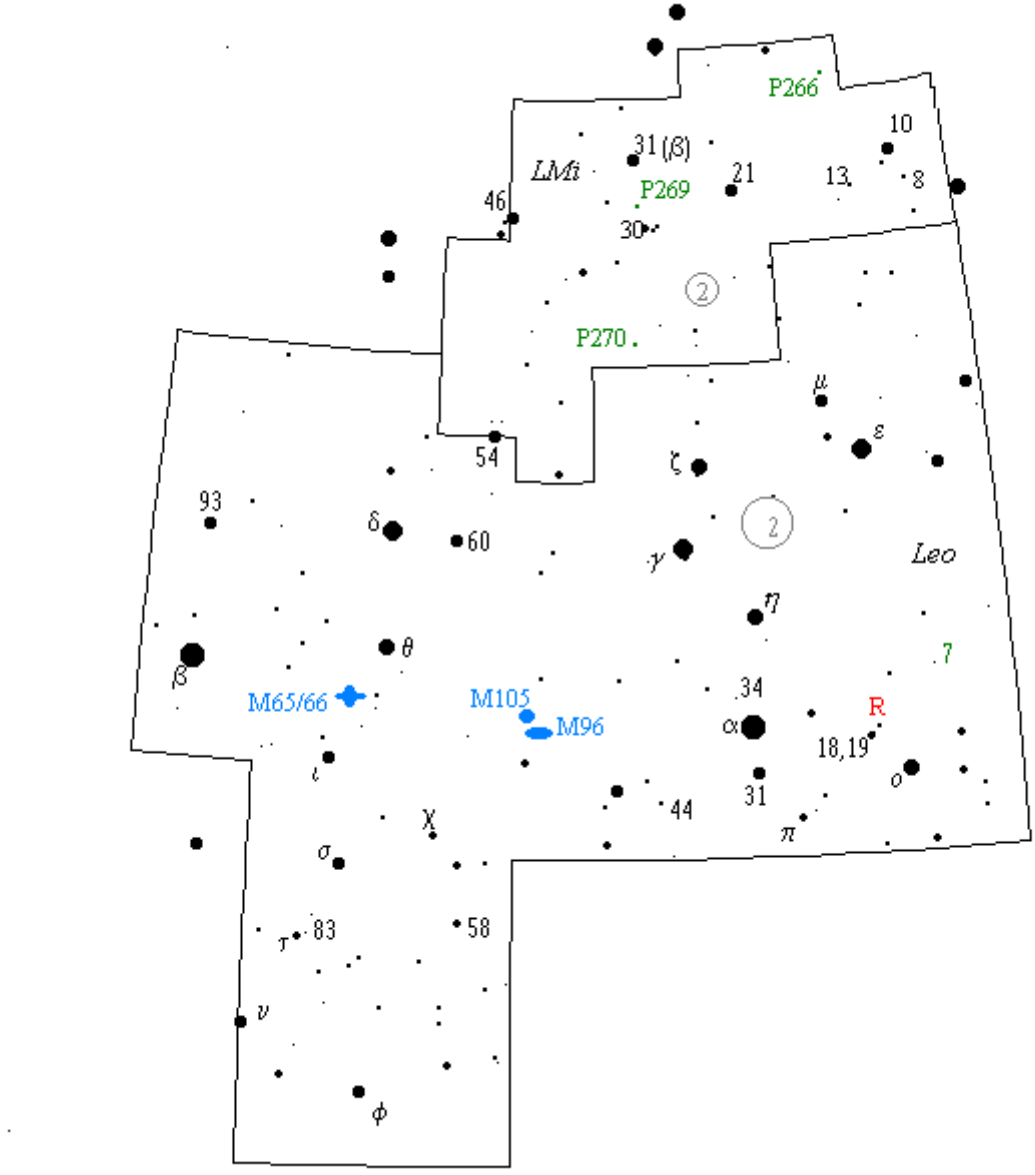
R (5-10) This popular variable, famous for its bright red colour, can be followed for most of its period with binoculars. Predictions are supplied for this variable.

Clusters and Nebulae

This is a fine group for the telescopic observer, as there are a great many distant galaxies here. Those which may be seen in bins are: Messier 96, 105, 65 and 66, but they will appear only as specks of light.

LEO MINOR

Chart



A small, insignificant group containing some binocular pairs, but little else. The only greek-letter stars it contains are, peculiarly, β and o. One other odd point of star nomenclature concerns the attractive little line of three bright stars in the East of the constellation. One member of the line is 46 Leonis Minoris, another is 46 Ursae Majoris. A strange coincidence!

Groups of stars

1. Fine sweeping within the area of 8(5.5), 10(4.6) and 13(6.0).

2. 10h 13m, +32°. Beautiful little symmetrical group.

3. 30 (4.8). A fine field that includes a wide red pair, P.268 (both 7.3m).

Wide doubles

10. Besides having 3 faint attendants, this has a brighter star NW.

Close doubles

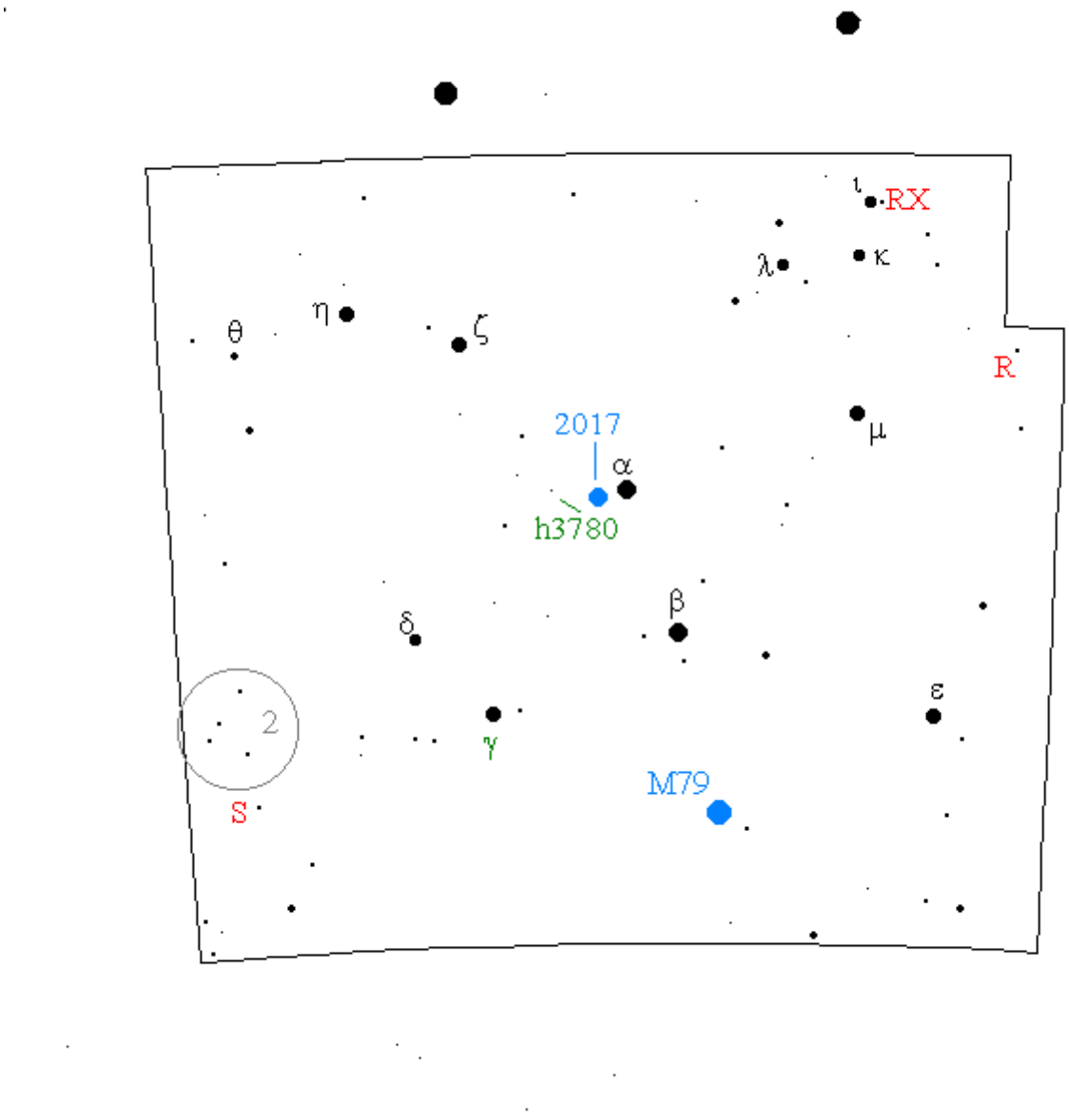
P.266. Difficult, as rather faint at 7.4 and 8.5. Distance is 120".

P.268. Mentioned under group (3), the separation of these is 208".P.269. Fainter and closer at 8.0 and 8.4, and 116 seconds apart.

P.270. Magnitudes 6.9 and 8.0, distance 132".

LEPUS

Chart



A beautiful little group both to the eye and binocular. Some fine groups.

Groups of stars

1. ι. Marks an area of fine sweeping, notably to the SW.

2. 06h 10m, -22°. Small group of bright stars, including a red one.

Wide doubles

β and μ .Lying between these is a wide pair, the S member of which is a close double of 38" separation, both blue.

Close doubles

h3780. Owners of good glasses should try this quadruple star, the comites being 76, 90 and 127 seconds distant from the primary. Note a bright vertical line to the E.

γ An easy pair of mags 4 and 6, 93" apart.

Variable stars

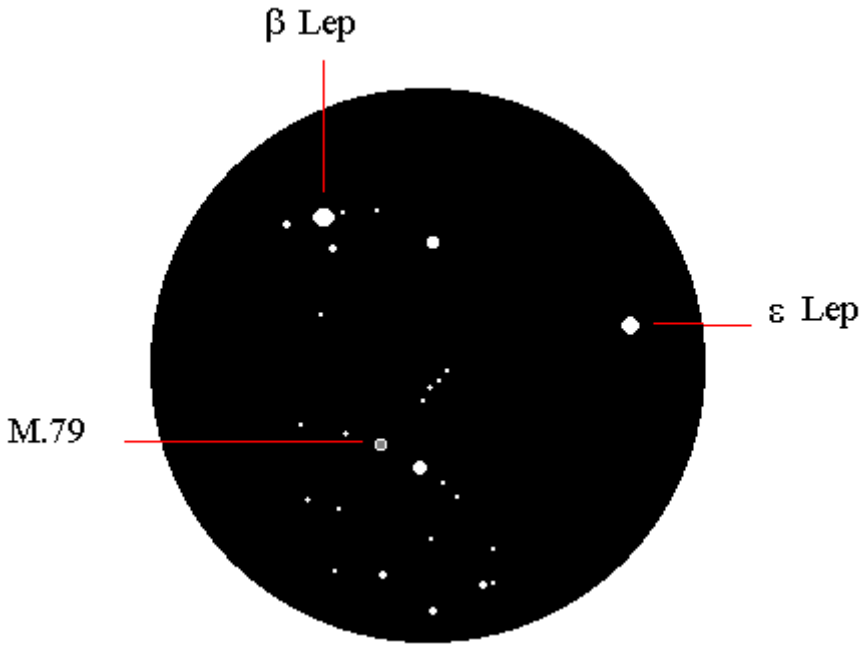
R (5.9-10.5) Called *Hind's Crimson Star*, this Mira variable is one of the front runners in the "reddest star in the sky" stakes. But you will need to catch it near maximum for the most impressive effects, so I have supplied predictions for it.

S (6.0-7.5) A good star for small glasses. A chart is provided.

RX (5.5-7.0) Another red star, forming a wide pair with the blue ι . A comparison of 7.0m lies close by.

Clusters and Nebulae

M.79 (NGC 1904). A globular cluster appearing as a faint burred star. Use the diagram

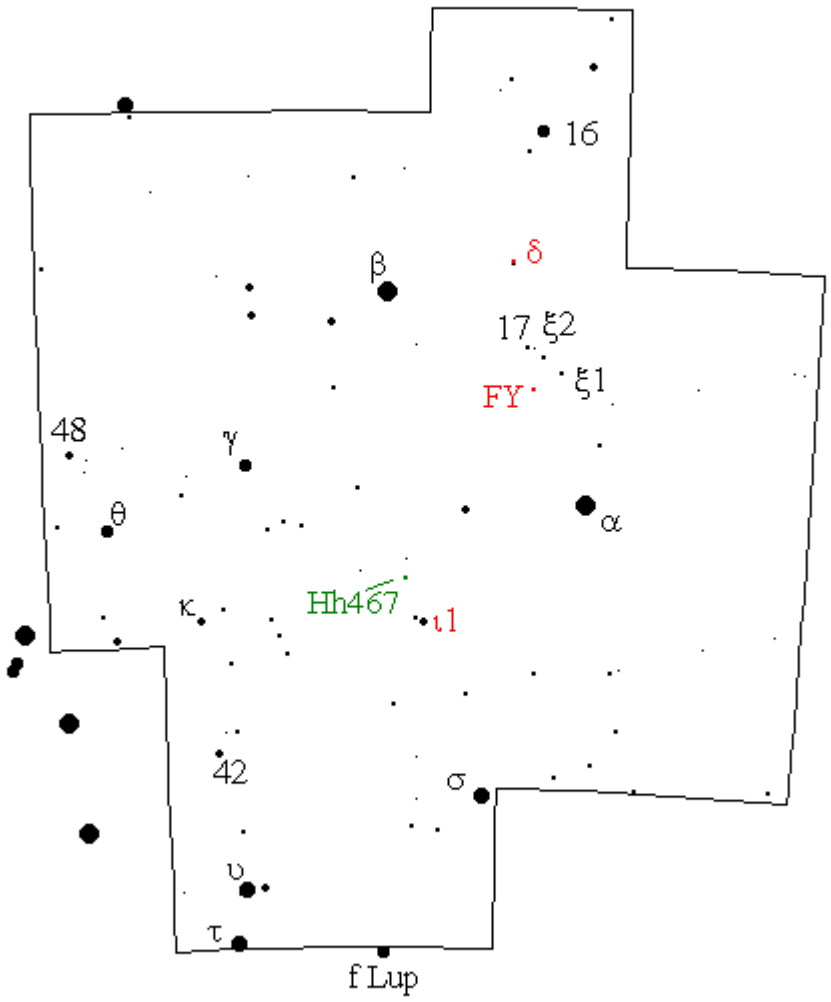


here

NGC 2017. Four or five stars can be seen in this cluster, just E. of alpha.

LIBRA

Chart



A group containing little of interest to the binocular observer, though its leader, beta, is said to be one of the few stars which appear green. Try it with binoculars and see what you think. All the brighter stars of Libra have long names beginning *zuben* -, an arabic word meaning "claw" and harking back to the days when Libra was not the scales, but the claws of the Scorpion.

Groups of stars

1. Rich area between 42 and κ.

2. 48 (4.7). An interesting region around this star.

Wide doubles

17 and 18. A fine sixth-magnitude pair.

α This has a 5m companion; good object for small glasses.

υ. A star with two wide companions.

Close doubles

Hh467. A difficult pair in a fine field. Mags 7 and 8, distance 47".

Variable stars

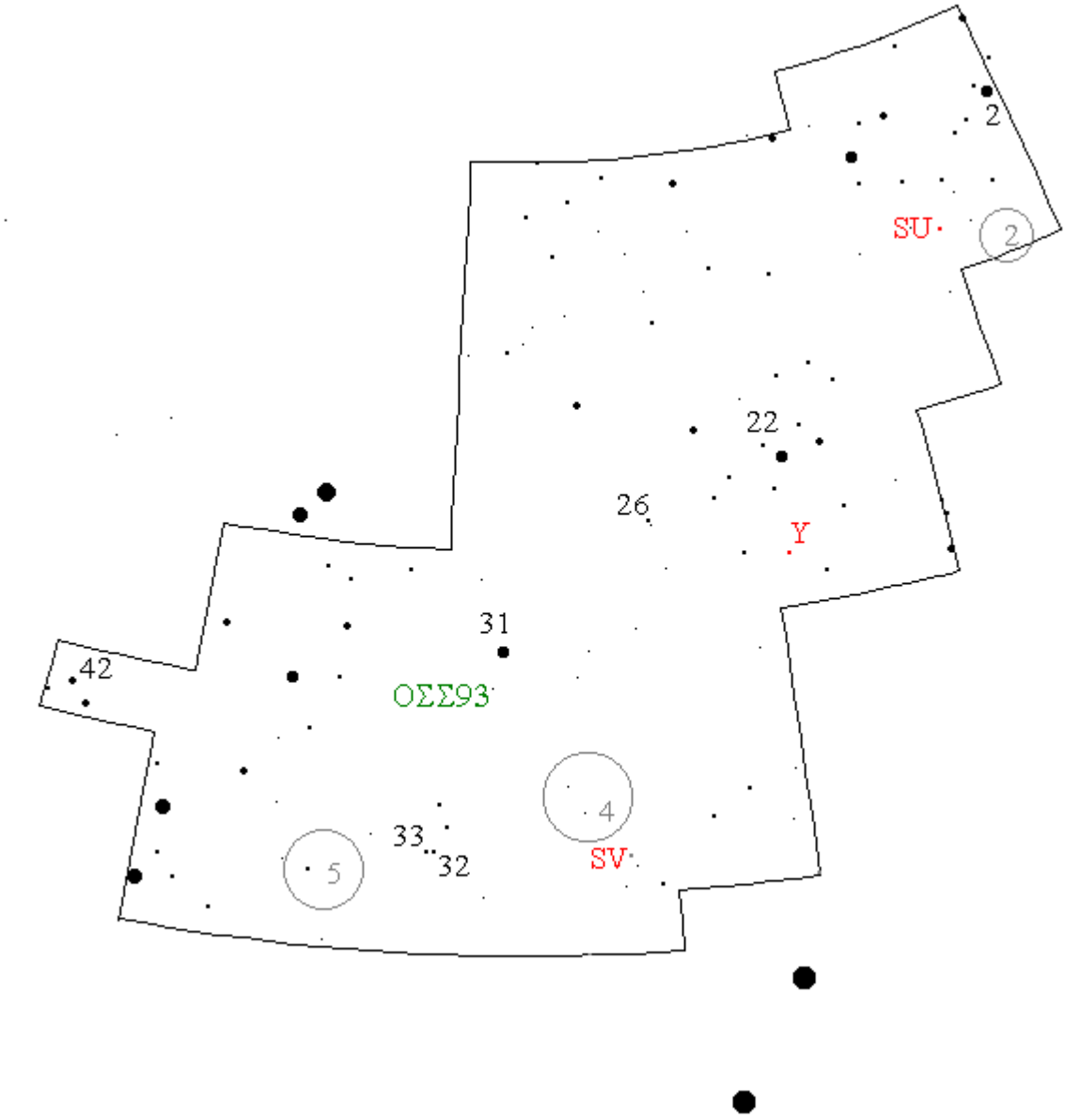
δ (4.8-6.2) An eclipsing binary, and one of those infuriating stars that are just too faint for the eye but too bright for bins! The stars 16 (4.6) and ξ2 (5.6) are useful here.

υ[1] (4.3-6.0) An irregular variable. Its neighbour is of 6.0m, and a wide line of three (5.7, 6.1 and 5.7) lies to the South.

FY (7.1-7.9) This red star makes a triangle with ξ[1] and 2, and older editions of *Norton's* show it as E-B 419, so that it was in the Red Star catalogue of two distinguished nineteenth-century observers, Espin and Birmingham. It is the northernmost of a little threesome whose other stars are 7.9 and 8.3m.

LYNX

Chart



An inconspicuous group to the eye, but possessing some fine fields in its NW corner.

Groups of stars

1. 2 (4.4) is in a brilliant field, which includes a wide pair.

2. 06h 27m, +55°. Small group of 8 faint stars.

3. Bright parallelogram includes 22 Lyncis, N of which is a curved line.

4. 08h 02m, +36°. Large group of various magnitudes.

5. 08h 52m, +36°. A rich area resembling a large star cluster.

6. 42 (5.3) is in a fine region for sweeping.

Wide doubles

25 and 26. A fine pair of mags 5.7 and 6.4.

32 and 33. A similar wide pair.

Close doubles

OΣΣ 93. A rather hard pair easily found from 31 Lyn. Magnitudes are 6 and 8 and the distance 77". What do the colours seem to be to you?

Variable stars

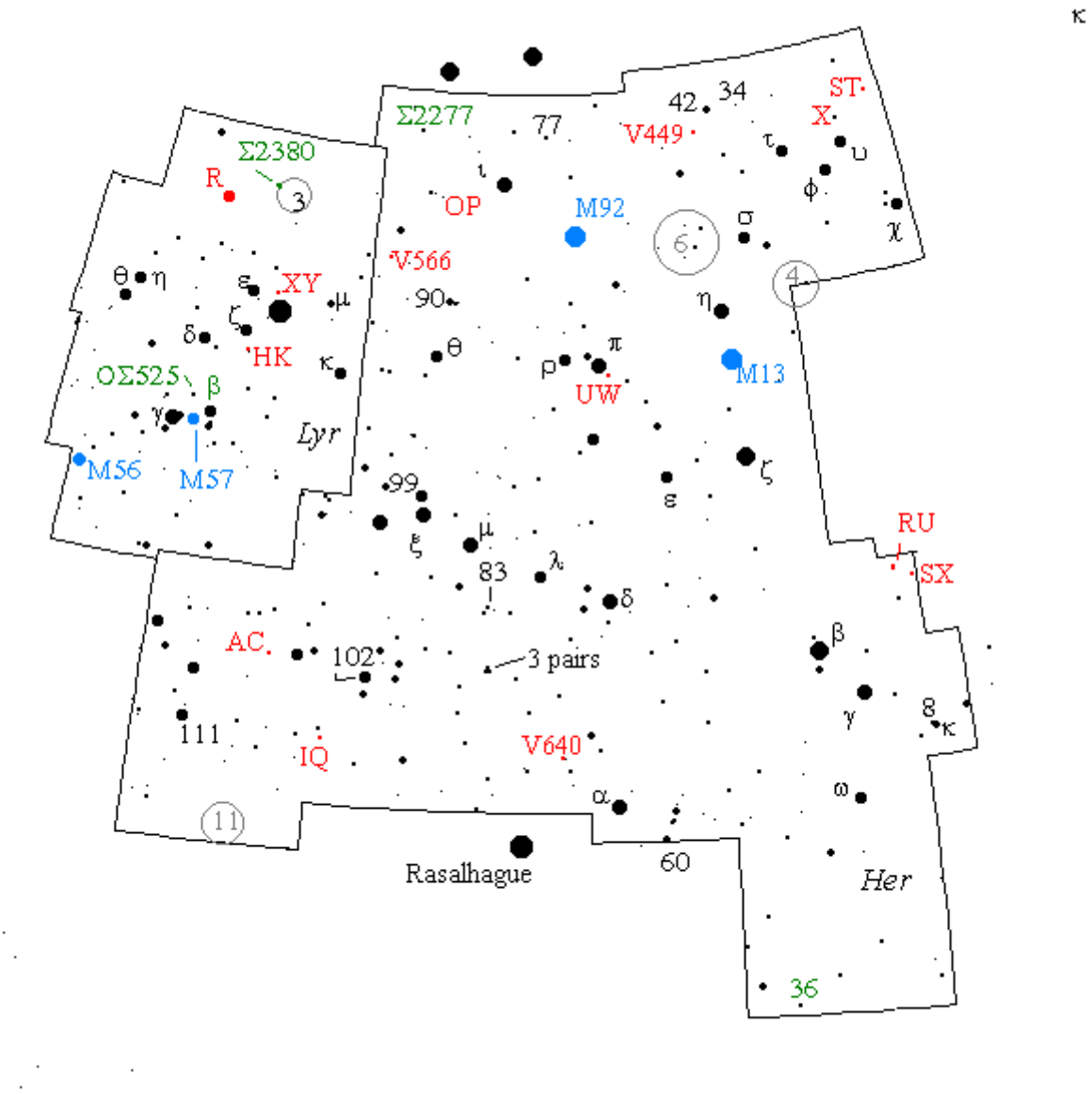
Y (6.9-7.4) A red star but of rather small range for us. Two stars just to the North are of 6.6 and 6.8m.

SU (8.0-8.9) Of similar type, this lies between two stars, one of which is 7 (6.4). This makes a triangle with two further stars of 7.4 and 8.2.

SV (6.6-7.5) A red irregular, with a line of three (6.1,6.5,6.6) to the S.

LYRA

Chart



A small constellation with many objects of binocular interest - fine fields, doubles and variables. Some old star-charts also show this constellation as a vulture.

Groups of stars

1. ζ . Fine region all around this coloured double star.

2. γ. Another bright star in a rich area.

3. 18h 44m, +44°. Small group of 13 faint stars.

Wide doubles

ε. This is the famous double-double (though you won't see all four with binoculars). The naked eye can double this star, but bins give a better view.

δ¹ and 2. A fine, contrasting pair. The latter is a red variable.

η. A faint, wide pair lies directly E.

θ. In the same field, this has a wide double to its SE.

Close doubles

Σ2380. A difficult pair in a fine area. Distance 26", magnitudes 7 and 8.

ζ. Yellow and blue with a distance of 44", this is a fine double.

β. The famous eclipsing binary has a 7m *comes* 47" away.

OΣ 525. A faint pair near beta, with the same separation.

θ. A star with a faint companion 100" away.

Variable stars

R (4.0-4.7). This is really a naked-eye star, but bins will bring out its fine red colour.

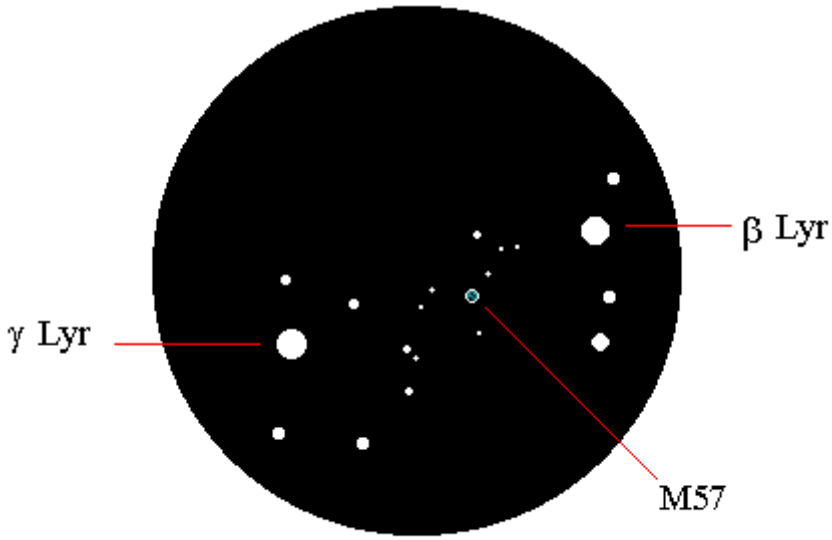
XY (6.1-6.6) Another red star. Near Vega, with two comparisons of 5.8 and 6.3 just to the N. I remember one particularly clear night when, from my home in Norfolk, I observed this star with the naked eye - the limiting magnitude was nearer 7 than 6!

HK (7.0-8.0) Difficult with small glasses due to a close 8m companion, but in a fine area just south of the double-double.

Clusters and Nebulae

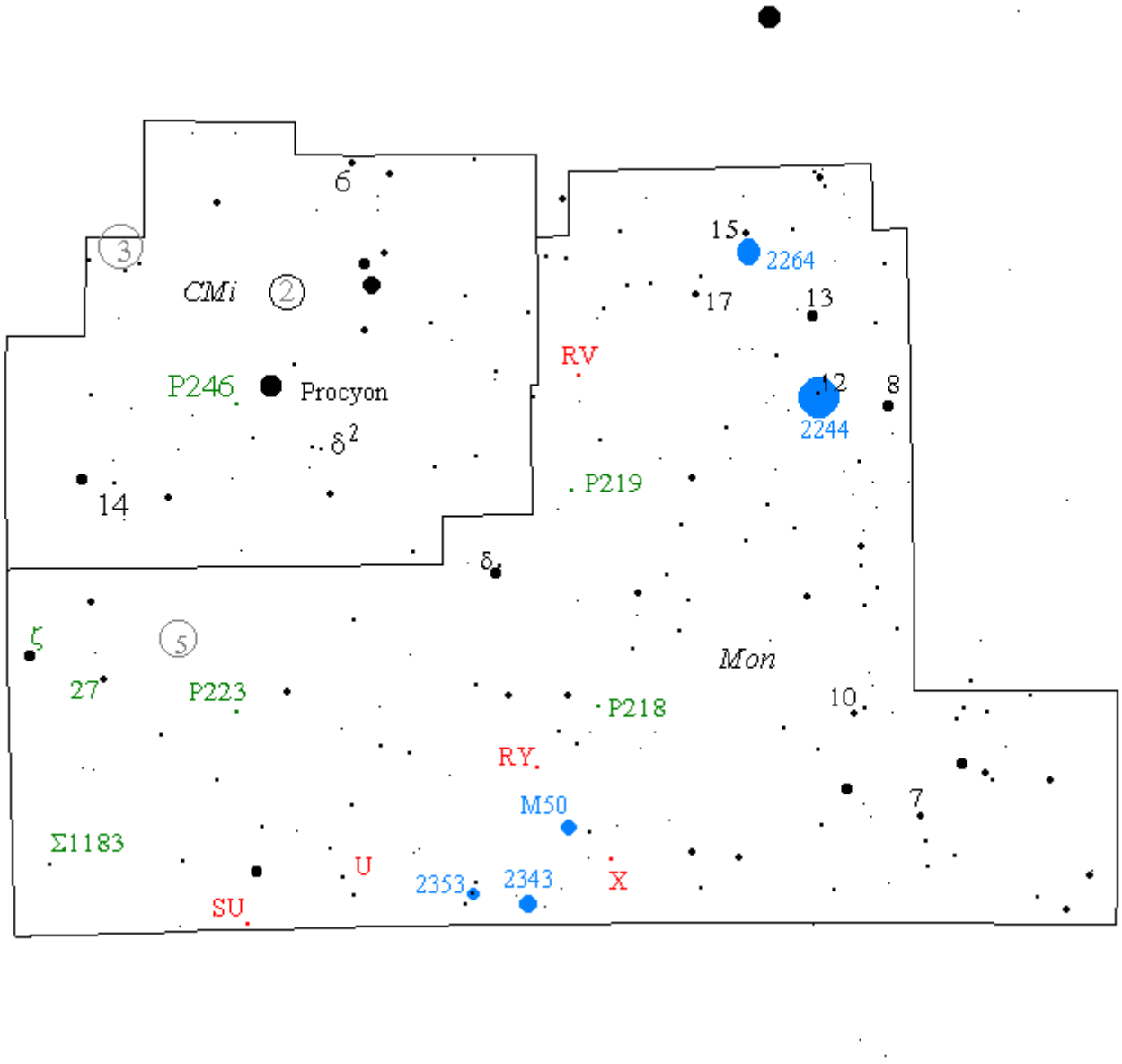
M.56 (NGC 6779). A globular cluster, visible as a hazy spot.

M.57 (NGC 6720). The ring nebula. With large glasses, it can be seen as a faint star. Quite a difficult object, so use the chart to find it.


β Lyr
γ Lyr
M57

MONOCEROS

Chart



A group replete with magnificent fields and clusters. It lies within the "Winter Triangle" of Sirius, Procyon and Betelgeuse, and contains a peculiar binary called *Plaskett's Star*, famous for being the most massive stars known. Each component of this peculiar double is 60 times more massive than the Sun. Most stars have masses of between 0.1 and 10 times the Sun's. Plaskett's star is of magnitude 6 and its position is given in the object index in the appendices.

Groups of stars

1. 12 (6.0), in the cluster NGC 2244, is surrounded by many brilliant formations.

2. 8 and 10. Sweep between these stars where you will find a bright group shaped rather like the constellation of Lyra.

3. 7(5.1). In a beautiful region.

4. Large triangle of 13, 15 and 17. Good sweeping here.

5. 06h 49m, -02°. Group of bright stars extending to 13 (4.5).

Wide doubles

07h 14m, -10°. Small triple, near the cluster NGC2353.

δ This 4.1m star makes a wide pair with 21.

Close doubles

Σ1183. A rather difficult, isolated pair. Mags 6 and 8, distance 31".

P.218. A faint pair in the central plane of the Galaxy. Mags 8.0 and 8.2.

P.219. A pleasant coloured pair of 6.5 and 8.3; 91" separates the faint star from its brighter blue primary.

P.223. A beautiful yellow and blue double of 6.8 and 7.0m. It can be found by drawing a line from ζ through 27 (5.1, orange) and prolonging it twice the distance.

Variable stars

U (5.6-7.3) An excellent star for the beginner, with good variations in a reasonable time. This member of the RV Tauri class is one of a little rectangle near α. The other members are 6.0, 6.6 and 7.0. Observe it once a week.

X (7.3-9.2) Another star giving good "value for money". A chart is supplied.

RV (6.8-8.3) A deep red star best found from the 6-7m arc a couple of degrees North. It lies between two stars of 6.5 & 7.1, and has a 7.7m neighbour.

RY (7.7-9.2) Another red variable, but with few good comparisons.

SU (7.7-9.0) A star of the rare spectral type S, 1° South of alpha. Take care to separate SU from its companion of 8.7 to the S. Just to the N. is a useful little triangle of 8.3, 9.0 and 9.0.

Clusters and Nebulae

NGC 2244. A brilliant cluster containg some bright coloured stars.

NGC 2343. Large instruments may show several little stars in this cluster.

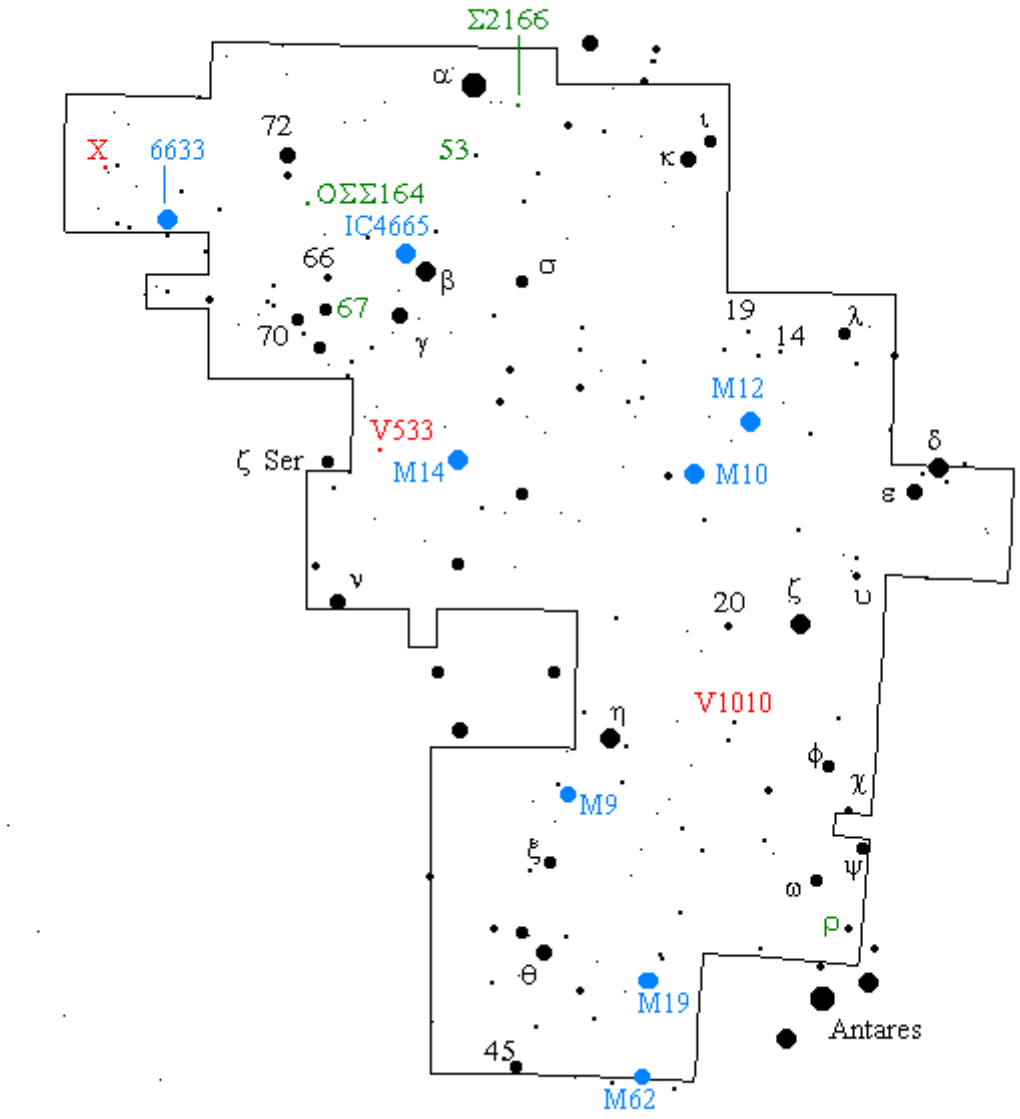
NGC 2264. Appears as bright in the centre, with a prominent star to the South.

M.50 (NGC 2323). A large cluster, partially resolved in 20x70s.

NGC 2353. A really fine object, showing several stars in binoculars.

OPHIUCHUS

Chart



A really vast group, containing relatively few bright stars to the eye, but revealing many beautiful sights to the binocular lenses

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Groups of stars

1. The *yeds* , or δ and ε. Fine sweeping around these stars, whose full names are Yed Prior and Yed Posterior. Imaginative or what?

2. Beautiful sprinkle around 19 (6.0).

3. Another neat group is near the 4.7m υ.

4. The naked-eye T-shaped asterism of 66, 67, 68 and 70; this used to be a separate constellation called *Taurus Poniatowskii* back in the days when influential patrons of scientists were being elevated to realms celestial! A beautiful part of the sky.

5. θ. In a region of numerous bright stars, clusters and dark nebulae.

Wide doubles

72. Has two companions, one of which is orange.

14. This has an attendant to the NW.θ. Note the orange star of 6.6m near this object.

Close doubles

Σ2166. A rather close pair (26") near Rasalhague.

53. An easier pair of magnitudes 6 and 7, 41" apart.

67. 55" apart, this is hard due to the 9m companion.

ρ. Binoculars reveal two companions. This star is in a large complex of dark nebulae which abound in this area. Best seen at high altitude and in dark skies.

OΣΣ 164. A faint pair 50" apart, readily found between 71 (4.7) and a curving line of bright stars.

Variable stars

X (6.5-9.0) A bright LPV, this is near a large bright parallelogram. Note a little triangle just E, of 7.3,7.2 and 7.1. Maxima of this star are given in the appendices.

V533 (7.0-8.0) A red star near ζ Serpentis. A large triangle of 6.5, 7.3 and 8.2 to the North can be used to estimate it.

V1010 (6.1-6.8) A chart is provided for this eclipsing binary.

Clusters and Nebulae

IC 4665. A really magnificent sight in binoculars, which will show over a dozen stars. An easy naked-eye object.

NGC 6633. Another marvellous cluster. A rather V-shaped group of many stars with an irresolvable glow behind them.

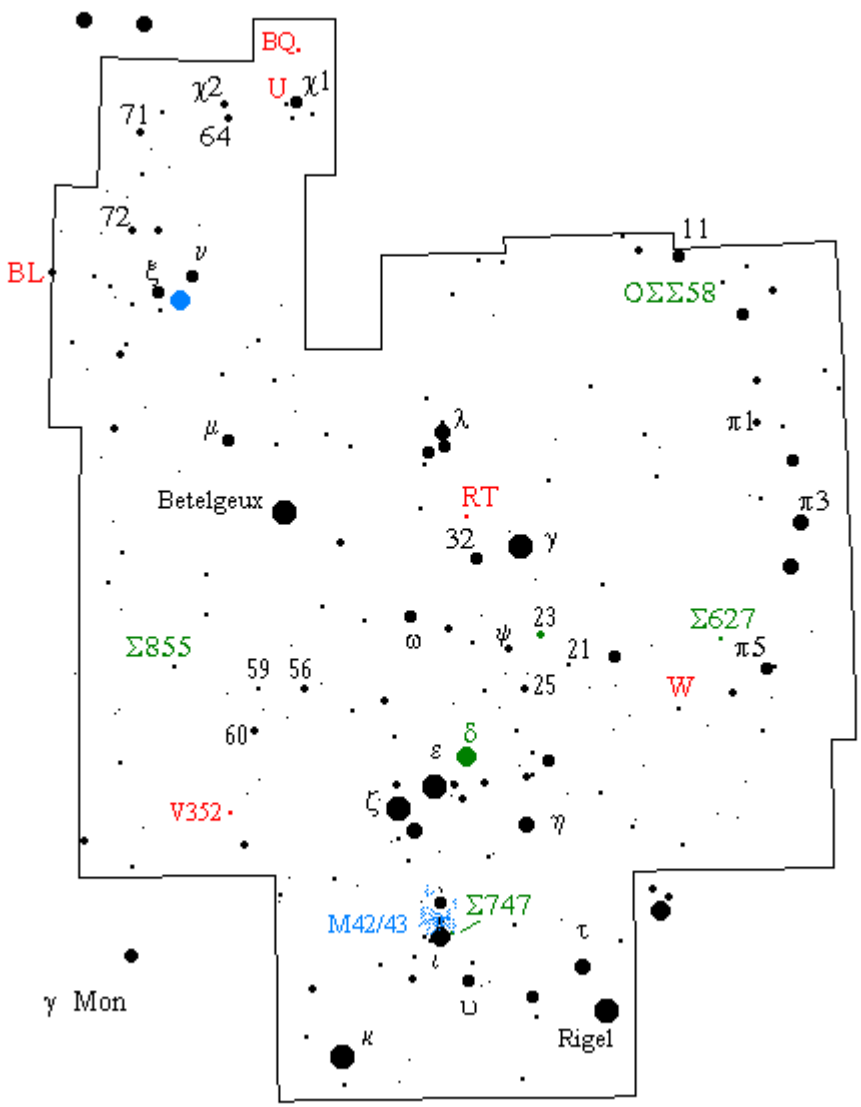
M.12(NGC 6218). A globular cluster, of which class there are many in Ophiuchus. It lies between two 6m stars.

M.10(NGC 6254). Another globular. A nebulous point in 6x30's.

M.19(NGC 6273). Yet another globular, as are M.9, 14 and 62. Try them all.

ORION

Chart



What can one say about Orion? The swordsman of the sky overwhelms us with his brilliant stars whether we use either naked eye or optical aid. The whole constellation teems with interesting objects - and is one of those rare instances in which the stars in a constellation really are, at least for the most part, connected with each other. Many wisps of nebulosity, and not just in the region of the famous nebula, either. Search out the whole constellation for these delicate objects when you have a suitably transparent night.

Groups of stars

1. The "shield" repays sweeping, even with the smallest glasses.

2. λ (3.7) forms a wide triple with ϕ^1 and 2, with a pretty little straight line of three close by. Some nebulous gleams here.

3. Small arc below ξ (4.4) terminating in the cluster NGC 2169.

4. 71. One of a bright semi-circle.

5. Brilliant trapezium of 21, 23, 25 and ψ . Many bright stars here.

6. Sweep along Orion's belt, noting another fainter and less regular line to the South.

7. The equally famous sword is one of the most beautiful parts of Orion; the powerhouse of the whole group, if you like. Note two small sprays near the Nebula, M.42.

8. 56, 59 and 60. Members of a bright but isolated group. 59 is an easy double star, and 56 is orange.

Wide doubles

π^1. A wide triple lies closely SW, of 6.1, 6.8 and 7.6. See if you can see any colour in the brighter stars.

72. A 5th-mag star with two yellow associates. Small group to the N.

π^3 The *lucida* of the shield has two attendants which form a right-angle.

π^5 Forms a contrasted wide pair with the red star 5 Orionis.

ζ Between this star and gamma Monocerotis is a wide triple of 6.0,6.2 and 7.1.

Close doubles

OΣΣ 58. Magnitudes 6 and 9, separation 89". One of a quadrangle.

Σ627. Easy to find, but hard to split at only 21".

23. One of group (5), this pair appears to me both white, though it is supposed to be yellow and blue. What do you think? Distance is 32".

δ. An easy pair, more definitely coloured, with a reddish secondary.

Σ747. A beautiful object near the Orion Nebula. 36" apart and both white.

Σ855. A more testing object of mags 6 and 7, 29" distant.

Variable Stars

U (6-12) A red Mira star which can become quite prominent, and which is very easy to find and estimate near maximum (see appendix). It is close to a bright trapezium, led by the 4.5m star χ1; the other stars are of 5.8, 6.0 and 6.6.

W (5.9-7.7) This deep red star is well-served with comparisons, including 21 (5.5) and a 6.3m just S. of rho. Directly between π^5 and 6 is a fainter star of 7.9m. Use small glasses on this variable, otherwise it appears too red.

RT (8.1-8.9) A chart is supplied for this red variable.

BL (6.3-6.9) This red star on the border with Gemini is one of a quadrilateral. Use the Northern members of 6.5 and 6.8 for comparisons.

BQ (6.9-8.9) There is a line of stars to the NE of 6.9, 7.5, 8.6 & 8.9. A good star to follow, with a decent range in light.

KX (6.9-8.1) This, along with NU, V359 and V372 below, appears on the chart here. All these stars are eruptive variables, associated in some way with the Nebula; young, and recently-formed out of the vast cloud of gas they inhabit.

NU (6.5-7.3) See above.

V359 (6.9-8.1) See above.

V352 (7.4-8.9) As a relief from nebular variables, try this red star, which is in a line of four. West to East, they are: 7.5, 8.4, V352, 9.0.

V372 (7.8-8.5) See above.

Clusters and Nebulae

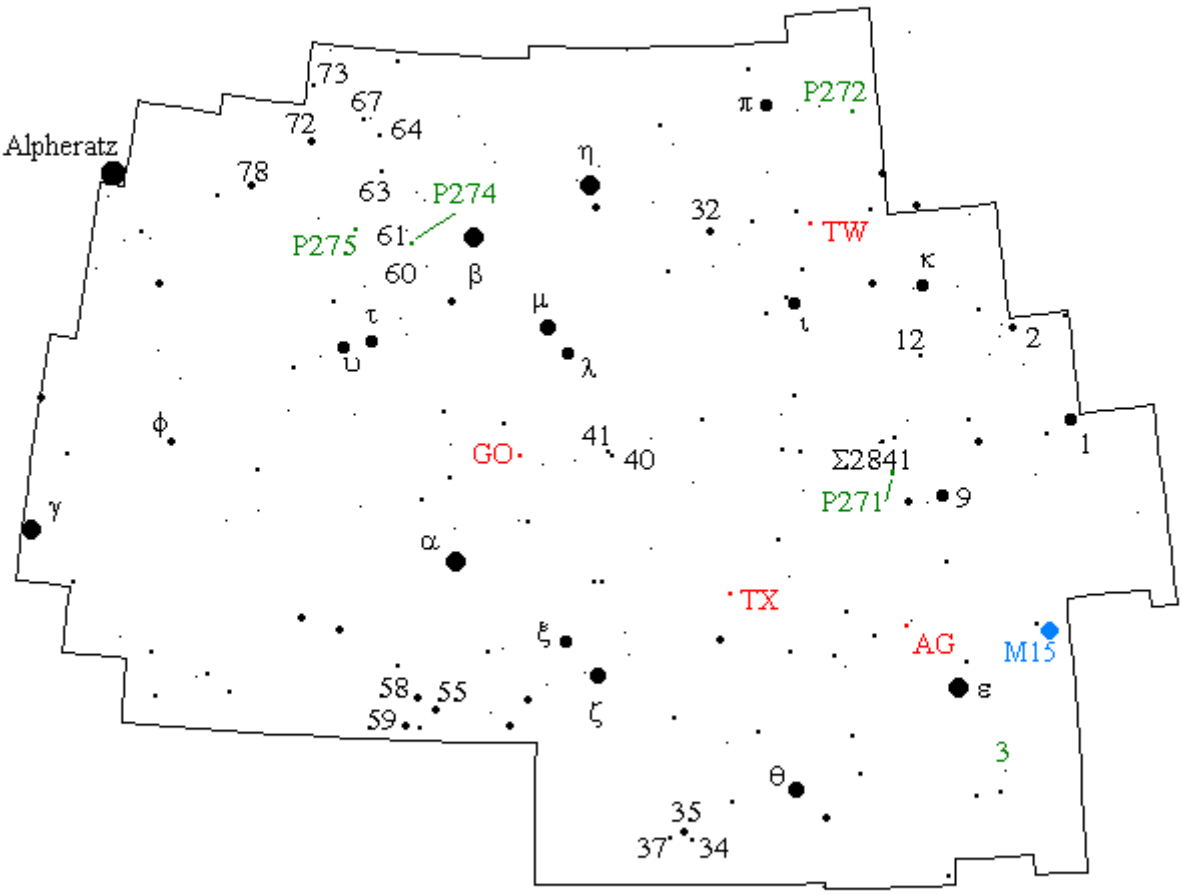
M.42(NGC 1976). The great Orion Nebula is easy with the naked eye, and binoculars of whatever size, but the larger the better, give an impressive view. The diagram under KX above shows the area in close-up and includes several bright representatives of the class of Nebular variables. One has to be careful in this area, as there are so many variable stars here that you never know if your comparison stars are variable themselves!

M.43(NGC 1982). Visible as a condensation around NU Orionis.

NGC 2169. A cluster visible as a misty patch.

PEGASUS

Chart



Another superb group for the binocular owner, and far more interesting than could be guessed at by the eye alone, especially in its Northwestern border with Cygnus. A common test of naked-eye acuity, or the clearness and darkness of the sky (or both) is to see how many stars you can make out within the square.

Groups of stars

1. Wide group of the red stars 63, 72 and 73, plus 64 and 67.

2. 78 (5.0) has a fine region to the S.

3. 32 and η . Between these there lies an amorphous group of 12 stars.

4. Arc of eight stars between ϕ and γ.

5. The region of υ (4.6) is worth perusal with small glasses.

6. An interesting area around 2 (4.8) and 12 (5.5).

7. The telescopic pair Σ2841 is one of a large, diverse group.

8. ε . Note the tiny inverted V to the NW that points to a 6m star.

9. Fine, singular group of coloured stars - 55, 57, 58 and 59. The second of these is slightly variable, and is also known as GZ Peg.

10. Smaller group of 34, 35 and 37. Incidentally, all of these are telescopic double stars.

Wide doubles

π. Forms a pretty pair with 27.

61. A 6.3m star with a 7m companion. Making an isosceles with 60 and 61 is another double, but closer and fainter.

40 and 41. A wide, sixth-magnitude pair.

Close doubles

3. An easy coloured pair, white and blue, 39" apart.

P.271. An eighth-mag equal pair, separated by 141 seconds.

P.272. Two 7m stars 131" apart.

P.274. Another seventh-magnitude pair, slightly wider at 185".

P.275. Inside the square of Pegasus, this is a harder object of 7.9 and 8.4, and separated by 63".

Variable stars

TW (7.0-9.2) A chart is supplied for this red variable; a star with a persistent secondary period (i.e., the mean magnitude itself varies over a long period of time).

TX (7.7-9.0) A star of similar type, with an 8.7m companion. It makes a long triangle with a 7.0 and 8.7, the latter to the N. Directly E of these is a line of three stars; 6.6, 7.8 and 9.3.

AG (6.0-9.0) This star erupted in the late 19th century, and is nowadays content to fluctuate between 8th - 9th mag, but needs watching just in case. It is one of a small cross whose other stars are 7.6, 8.0 and 8.5.

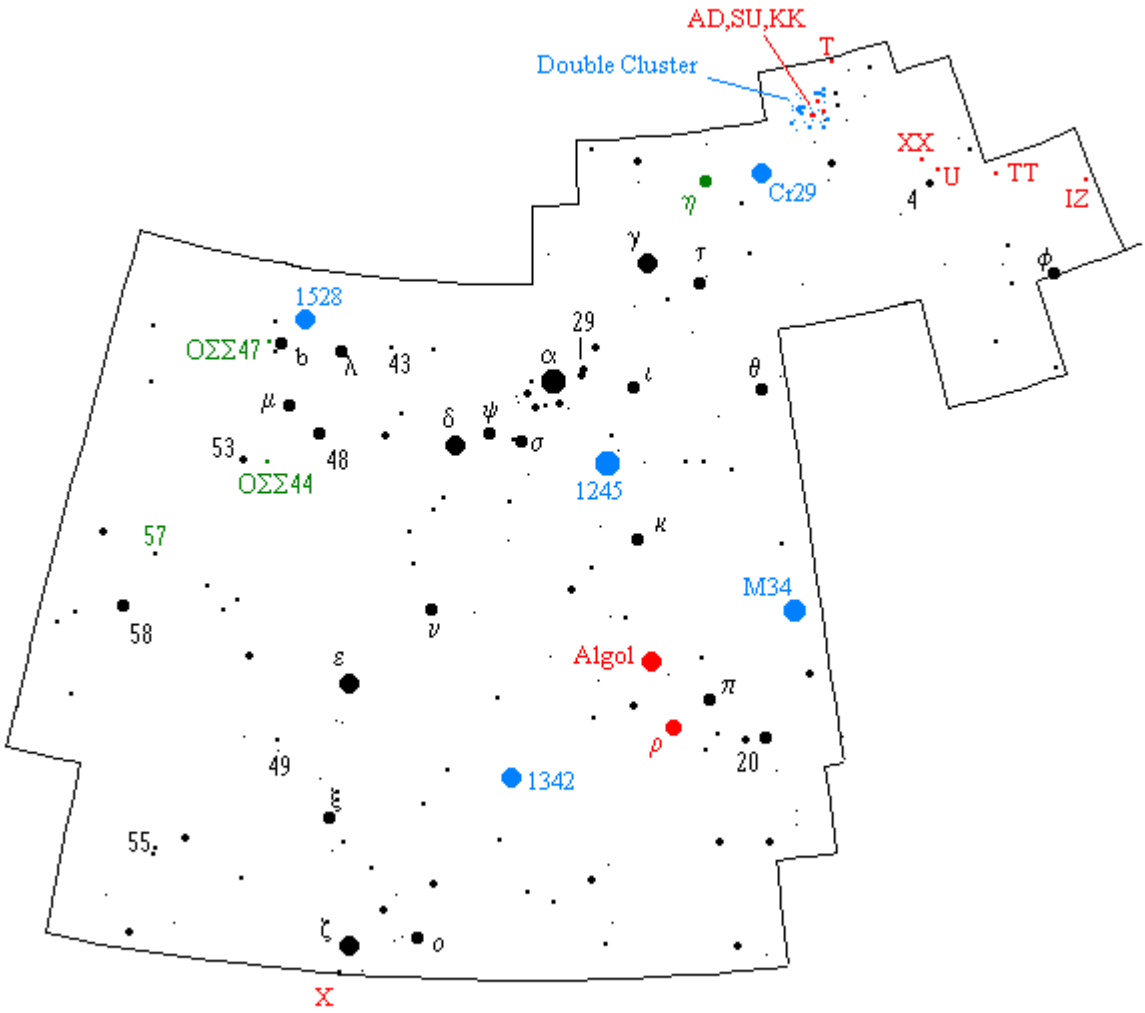
GO (7.1-7.8) An easy star to find and estimate, since there is a small vertical line of three (7.1, 8.1 and 8.8) closely E.

Clusters and Nebulae

M.15(NGC 7078). A brilliant globular cluster. In 20x70s, this is my favourite among these objects. Note a strange little Y to the South.

PERSEUS

Chart



After Cygnus, this is probably the finest group in the Northern sky for owners of binoculars, of whatever size. Its clusters are especially notable, several being in fact visible with the eye alone. Brilliant sweeping along the borders with Camelopardus and Cassiopeia.

Groups of stars

1. α (1.8). Lies in a glorious low-power field (see below).

2. Fine large group of λ , μ , 48 and b. Many fainter stars and little gleams in this area.

3. 43 (5.5). Beautiful sweeping around this star.

4. Sweep the triangle bordered by θ , ι and κ.

5. 20 (5.3). Fine sweeping for small bins around this area.

6. Small, rather square group closely E. of ε (3.0)

Wide doubles

29 and 31. A superb wide pair near Mirfak.

σ . A lovely wide triple, the other stars being 5.5 and 6.0m.

o. A star with a faint companion SE.

49. Forms a wide threesome with 50 and a third star which is actually a telescopic pair.

ε and ν .Making an equilateral with these is a 6m star with a wide, equal pair lying to the SE. A nice object for small glasses.

55 and 56. Another wide pair in a fine field.

Close doubles

η .This is said to be red and blue. The companion is meant to be 8m, but it always looks at least 9m to me. A very hard one, this, even for small telescopes!

OΣΣ 44. A fine, both-white pair 58" apart.

OΣΣ 47. These are 75" apart, with a third faint star forming a triple.

57. A lovely yellow and purple pair. Mags 5 and 6, distance 114".

Variable stars

T (8.3-9.3) A red star in a crowded field. Note a beautiful clustering nearby.

X (6.0-6.6) A hot white variable, made up of the main star plus an exotic *neutron star*. X Per is a strong emitter of x-rays because of this, and is readily seen in the smallest glasses. It makes an equilateral with ζ and a 6.1m star, with another of 6.6 closely NW of zeta.

TT (7.6-9.0) This red star has a wide pair of 7.6 and 8.3 NW which are useful as comparisons.

XX (7.5-8.8) Another red variable, for which you can use two stars of 7.6 and 8.0, Northeast of the nearby 4 Persei. This and the preceding star lie close to a well-known red Long-Period Variable, U Persei, which reaches the 8th magnitude at maximum.

AD (7.7-8.4) Worth finding for its colour and also the fact that it is a member of the double cluster, as are several other red variables in the area, such as SU, PR and KK below.

IZ (7.7-8.9) An eclipser between two phi's; phi Per and phi Cas. Difficult because of a close, faint companion.

KK (6.6-7.6) I watched this star for about two years in the mid-seventies without seeing it move very much from 7.9m. Similar behaviour is typical of many small-amplitude red variables. In the double cluster, so even if you have scant luck with its variations, you will at least get a good view of the cluster!

Clusters and Nebulae

NGC 869/864. The magnificent double cluster, one of the most beautiful sights in the whole Northern skies. Use as large a pair of bins as you can get hold of and you will not be disappointed. Note the presence of several red stars. Very easy with the naked eye as a brightening in the Milky Way.

M34(NGC 1039). Another splendid cluster. 15 stars are seen in 10x80's, and I note that it lies in a long, irregular pentagon. Easy in 6x30 as well.

NGC 1528. A fine sight in average binoculars, and partially resolved in large ones.

Mel 20. A brilliant group of bright stars around Mirfak. (Mel is short for *Melotte* - Messier and the Herschels didn't bag them all!)

Cr 29. Named by another cluster specialist, Collinder, this is a fine group of faint stars near the double cluster.

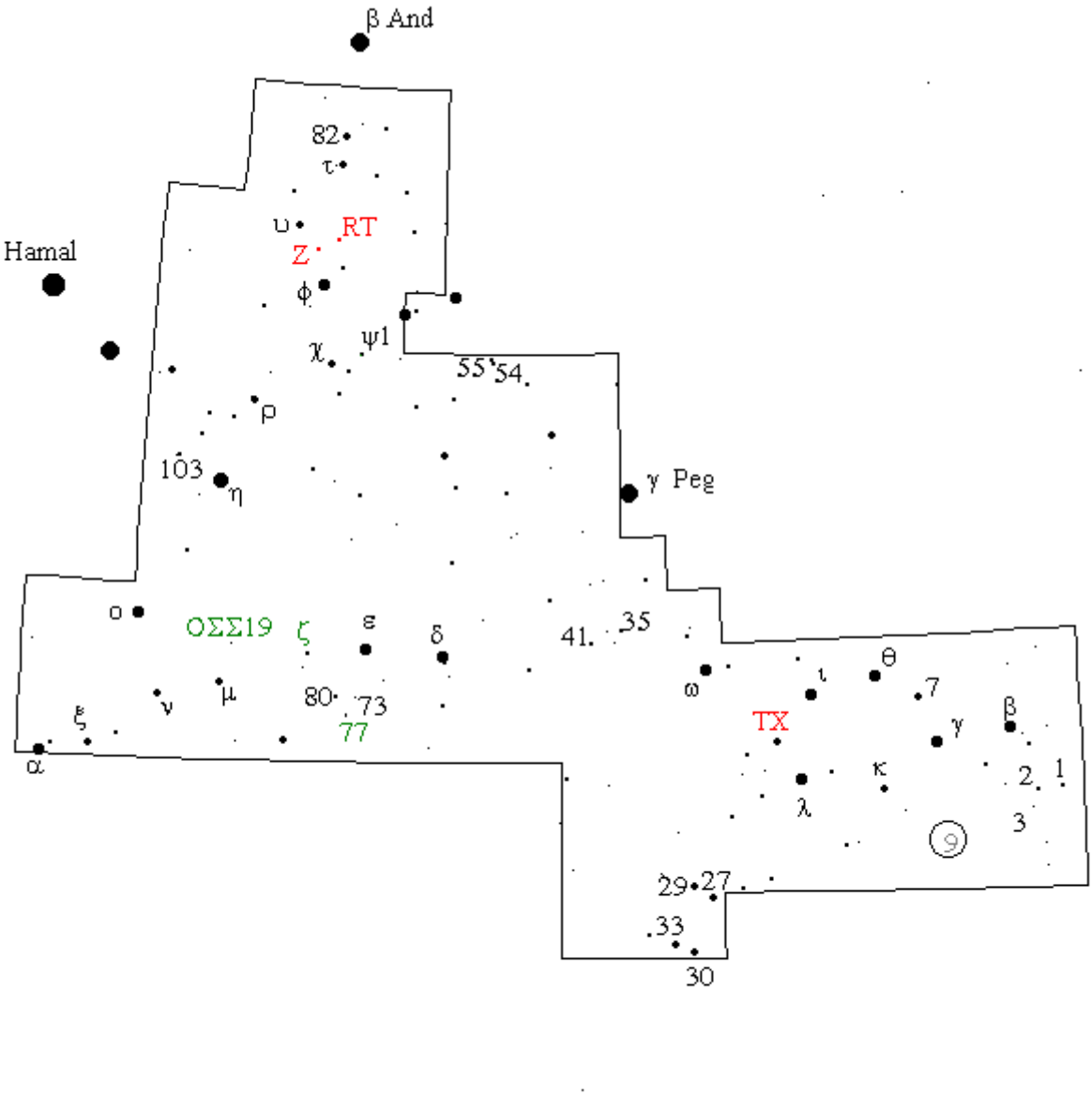
NGC 1245. With 10x or 16x50, you will see this as a misty spot.

NGC 1342. A fine cluster, which binoculars will partially resolve

.

PISCES

Chart



A faint, dull group to the eye, but with some fine fields and pairs.

Groups of stars

1. 82 (5.0) lies in a rich region.

2. Small isolated diamond of 35, 36, 38 and 41.

3. Beautiful bright Y composed of $\psi^{1,2,3}$ and χ .

4. The circlet. An asterism formed by γ, θ, ι, λ, κ, 7 and TX, the last of these a deep red star.

5. The group formed by 27, 29, 30 and 33. The latter two are red stars.

6. Small triangle of 73, 77 and 80. Many fainter stars around here.

7. ξ (4.8). Note a bright group W of this.

8. Small, bright assemblage including 1, 2 and 3. A close pair lies NE of the latter.

9. 23h 15m, -02°. Small faint Y, with a tiny line of three SW.

Wide doubles

τ . Two distant companions lie to the SW.

54 and 55. A conspicuous wide pair in a fine field.

χ Note a wide double of 7.0 and 7.2 to the SW.

ρ and 94. A notable low-power pair.

103 and 105. A similar but slightly fainter pair near the dim galaxy M.74.

κ In the circlet, this has an orange attendant of 6.4m.

Close doubles

ψ¹. A fine, roughly equal pair of the 5th magnitude. Dist. 30".

77. This star has a 7m *comes* 33" away.

ζ . A close (24") double of yellow and purple.

OΣΣ 19. The distance here is 68" and the mags. are both 7.

Variable stars

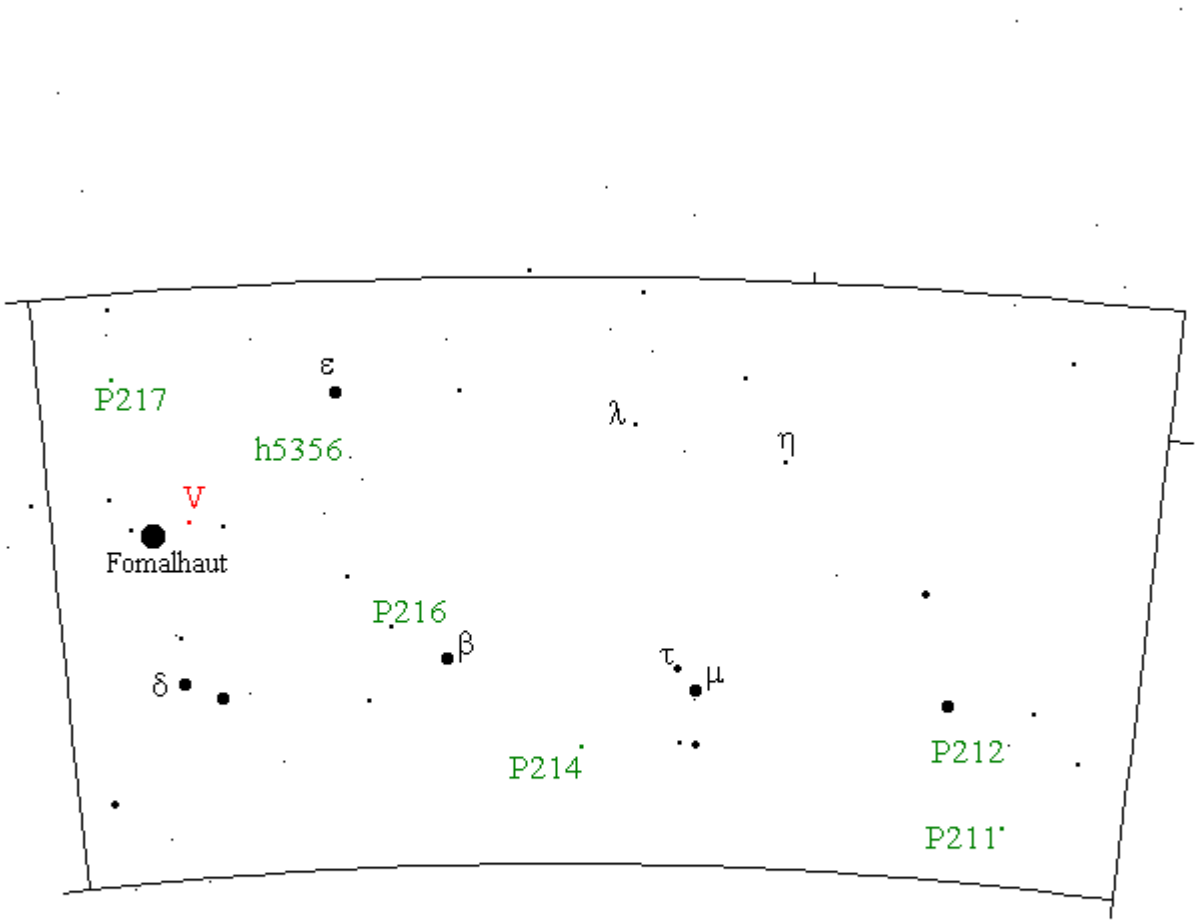
Z (7.0-7.9) The little Y of 7.5, 7.8, 7.9 and 8.5 closely NW of this red variable make good comparisons.

RT (7.6-9.0). A fainter star in the same field. To the south are two stars of 7.5 and 7.9, while an equal distance N. is a faint wide pair of 8.8 and 9.1.

TX (5.0-6.0) The stars in the circlet can be used on this deep red star. 22 Psc (5.8) is useful when TX is faint.

PISCIS AUSTRINUS

Chart



A compact group whose leader, Fomalhaut, can become quite bright from Europe and the southern parts of Britain. The rest of the constellation, however, needs altitude to reveal the numerous fine binocular double stars here.

Groups of stars

1. Bright, singular group that includes the 5m stars μ and τ.

2. λ (5.4). Fine sweeping north, and towards eta (5.4).

3. Large bright arc extending from ε to β .

4. δ . Lies in a fine field, with stars of assorted brightnesses.

Wide doubles

μ This has a companion of 6.4, also tau nearby.

δ . A degree north is an orange pair of 6.1 and 6.5.

Close doubles

h5356. A fine, easy pair of mags. 6 and 7 that are 85" apart.

P.211. Tucked away in the South of the group is this rather faint pair of magnitudes 7 and 8. Distance is 78".

P.212. A bright (6.3m) star with a 9m neighbour 235" away. Owners of powerful bins may also be able to divide this star into 9.1 and 9.3m stars 78" apart.

P.214. A much easier object, both yellow and 7th-mag. Distance 142".

P.216. Easy to find near β , this is a good star for average glasses. Mags are 5.7 and 7.3, 91" apart. Both stars are orange.

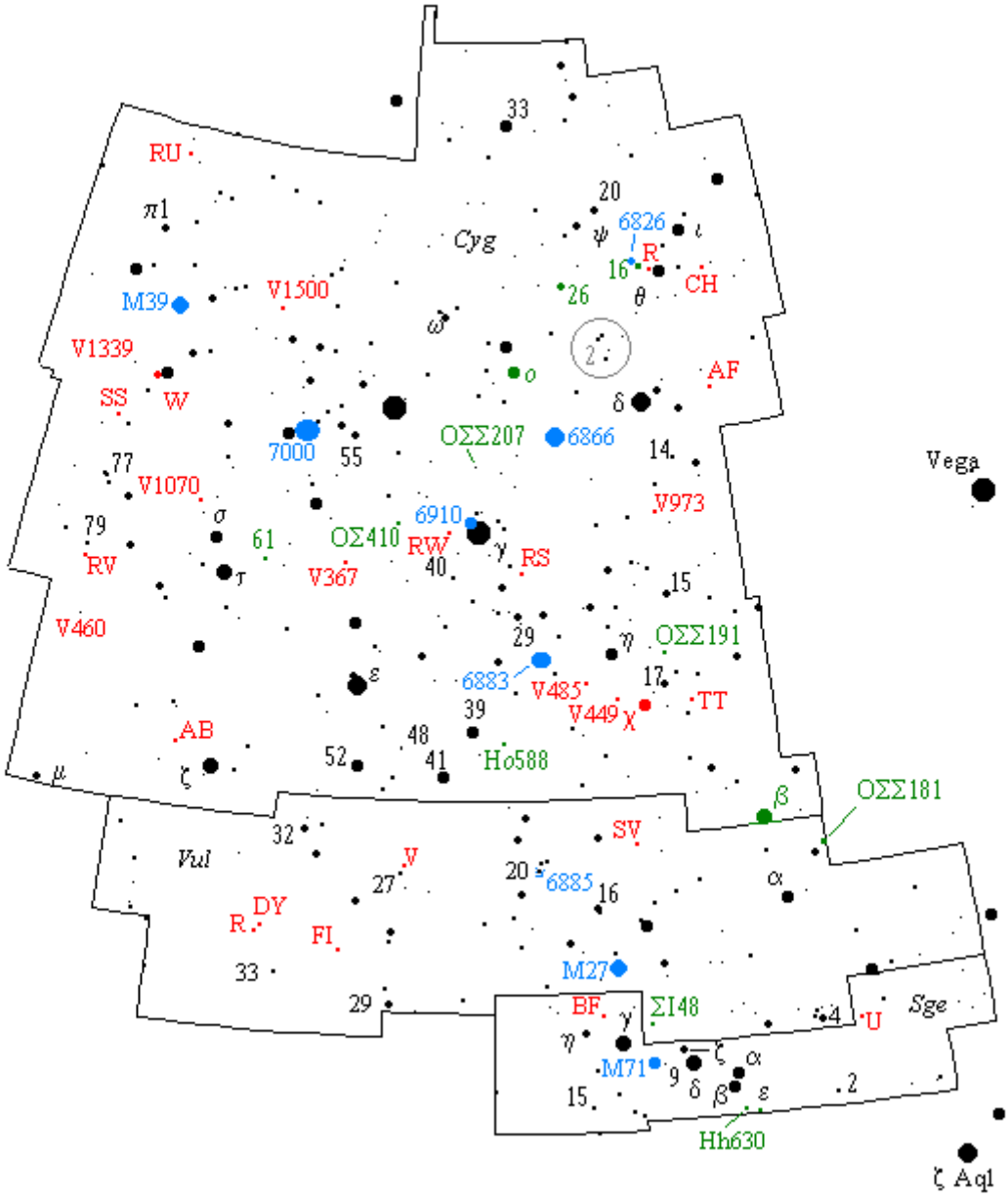
P.217. An unequal pair of 7.4 and 8.8, distant by 108". It is the southern member of a line of three bright stars. Note the red tint of the Northern one.

Variable stars

V (7.7-9.1) This lies agonisingly close to Fomalhaut. SW of V, and in line with it, are two stars of 8.8 and 9.1, with another of 8.4 S. of the brighter of these. Another star NW of the variable is of magnitude 7.6.

SAGITTA

Chart



A small but distinctive group containing some beautiful fields. It actually extends some distance east of the four little stars which form the arrow itself.

Groups of stars

1. Fine bright group of α , β , δ and ζ . Note the curving line stretching from delta.

2. ζ . Beautiful sprinkles around this star.

Wide doubles

ζ Aql. 3° North of this star is a notable wide pair of 5.7 and 6.4.

2 and 3. These make a similar fine wide double.

9. Note a tiny 9m. equilateral triangle closely NE. Near the cluster M.71.

15. A 5.9m star with a 6.8 companion.

Close doubles

ε . A beautiful coloured double 90" apart, and of mags 6 and 7.

Hh630. A harder pair of magnitudes 7 and 9. Distance 29".

ζ . In a superb field, has a distant 7m companion.

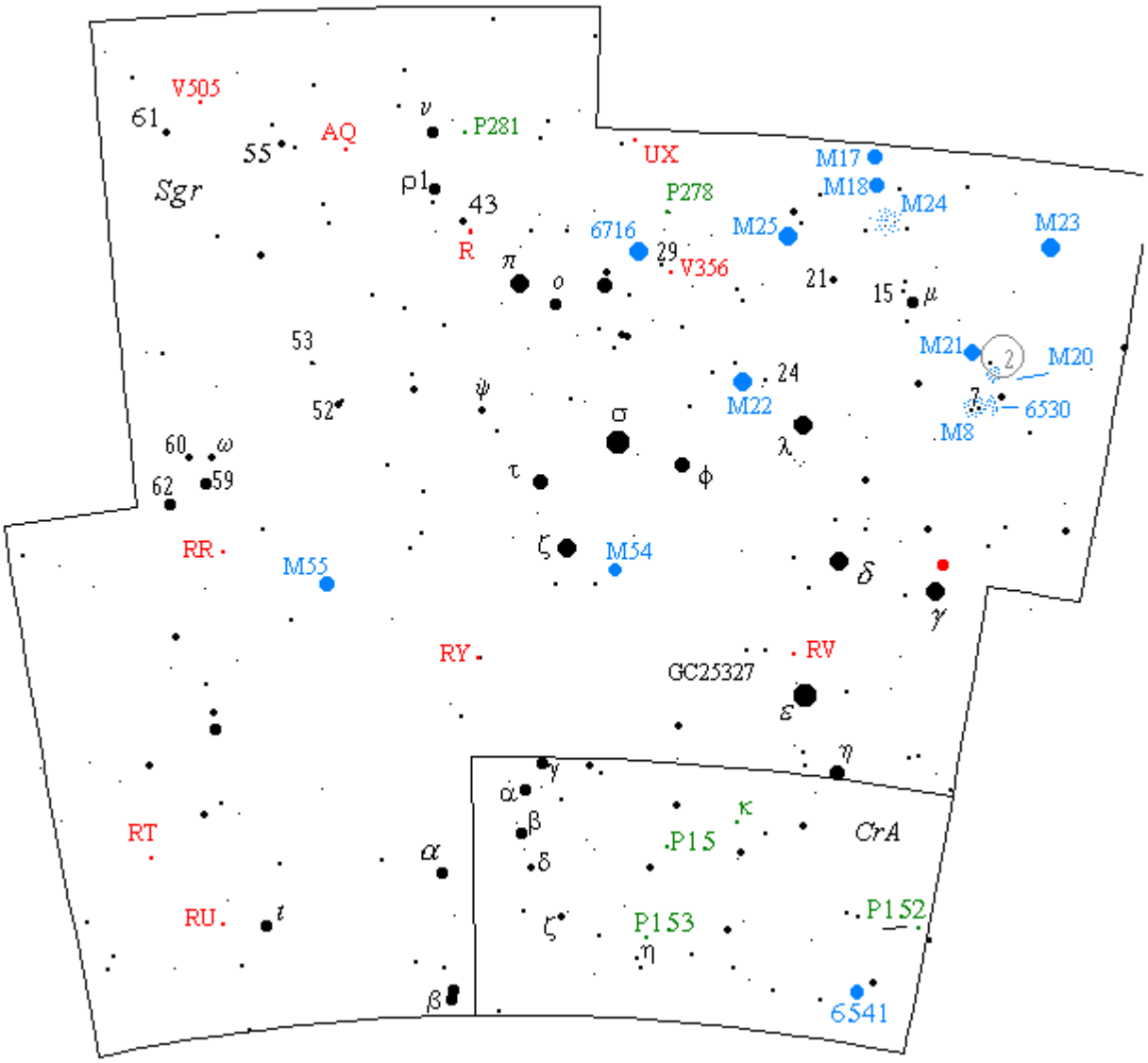
Variable stars

U (6.4-9.0) An eclipsing binary; one of a small rectangle whose other stars are of 7.9, 8.1 and 8.5m.

BF (8.0-9.0) A red star in a very dense field. A chart is supplied.

SAGITTARIUS

Chart



The richest region of the entire sky, the centre of our Galaxy, lies beyond the glowing star-clouds of the Archer. Best seen from the USA or Southern Europe, the most notable part of the group to the eye is the large, symmetrical collection of second- and third-magnitude stars affectionately called the "teapot" because of its shape.

Groups of stars

1. 18h 00m,-22°50'. Small oval of brightish stars.

2. Small bright group, including 24 (5.7).

3. μ (4.0). Beautiful fields between this star and gamma Scuti.

4. o and π . Two members of a beautiful large and bright group.

5. ω , 59, 60 and 62. Beautiful bright cross.

6. Large, regular arc, directly east of η .

Wide doubles

7 and 9. Both of these are closer pairs. 7 is the best - 6.9 and 8.5, distance 35". In the Lagoon Nebula.

15 and 16. A third star is visible.

o. A star with a 6m associate NW.

52. Forms a wide pair with 51, one magnitude fainter at 5.7.

53. In the same field, this is a closer pair of 6.1 and 6.2.

$\beta^{1,2}$. A fine, wide pair in a rich field.

Close doubles

GC25327. A close pair of magnitudes 5 and 7.

P.278. A lovely white pair of stars separated by 121". Mags are 6.5 and 7.0.

P.281. Though distant at 196" this object is quite faint - both 8th mag.

Variable stars

RY (6.5-14) A star of the unpredictable R Coronae type. It can be estimated at maximum with three stars of 5.6, 6.5 and 6.9 to the SE, and is closely North of a 7.4m star; when you feel the need to use this star as a comparison, you will have to make this observation known, as RY Sgr will probably be entering one of its unpredictable fades.

UX (7.6-8.4) This makes a triangle with two bright stars, and the fainter of these has a companion of 8.0m which you can use for this red variable.

AQ (6.6-7.6) A chart is supplied for this deep red star.

V356 (6.9-8.0) An eclipsing binary near 29 (5.4), with a star of 8.1 between the two serving to note when V356 is at or near minimum.

V505 (6.4-7.6) A star of the same type, with a period of only 1.25 days. It is exactly halfway between 61 Sgr and a 6.2m star, and there is a fainter one of 6.8m closely SW of the variable.

Note : there are several Mira stars in Sagittarius that are easily visible with binoculars at maximum. I have provided predictions for the following examples:-R, RR, RT, RU and RV.

Clusters and Nebulae

M.8 (NGC 6523). The beautiful Lagoon Nebula, visible with the naked eye. It has an attendant cluster, but needs good altitude for an impressive view.

M.21 (NGC 6531). With 8x30's, you will see several bright, and many faint, stars before an irregular nebulosity.

M.24 (NGC 6603). Not so much a cluster as a rich star-cloud. Twenty stars are visible with 10x80. A bright elliptical glow in small binoculars.

M.22 (NGC 6656). A very bright globular cluster, looking rather like a comet, with a noticeably brighter centre in 8x30.

M.25 (IC 4725). A dense cluster of several stars beyond which can be seen a nebulous glow.

M.17 (NGC 6618). The *Omega* or *Horseshoe* nebula. Imre Toth, using 10x80's, sees this as "Triangular, with apex to the South and the brightest part to the North... bright grey colour".

M.18 (NGC 6613). An open cluster appearing to the same observer as a bright grey nebulosity, rather whiter in parts.

M.20 (NGC 6514). The famous and photogenic Trifid Nebula has a faint greenish tinge, with several stars involved in it.

M.23 (NGC 6494). A nebula visible as a bright diffuse streak.

M.54 (NGC 6715). A moderately bright globular in a fine field near zeta Sgr.

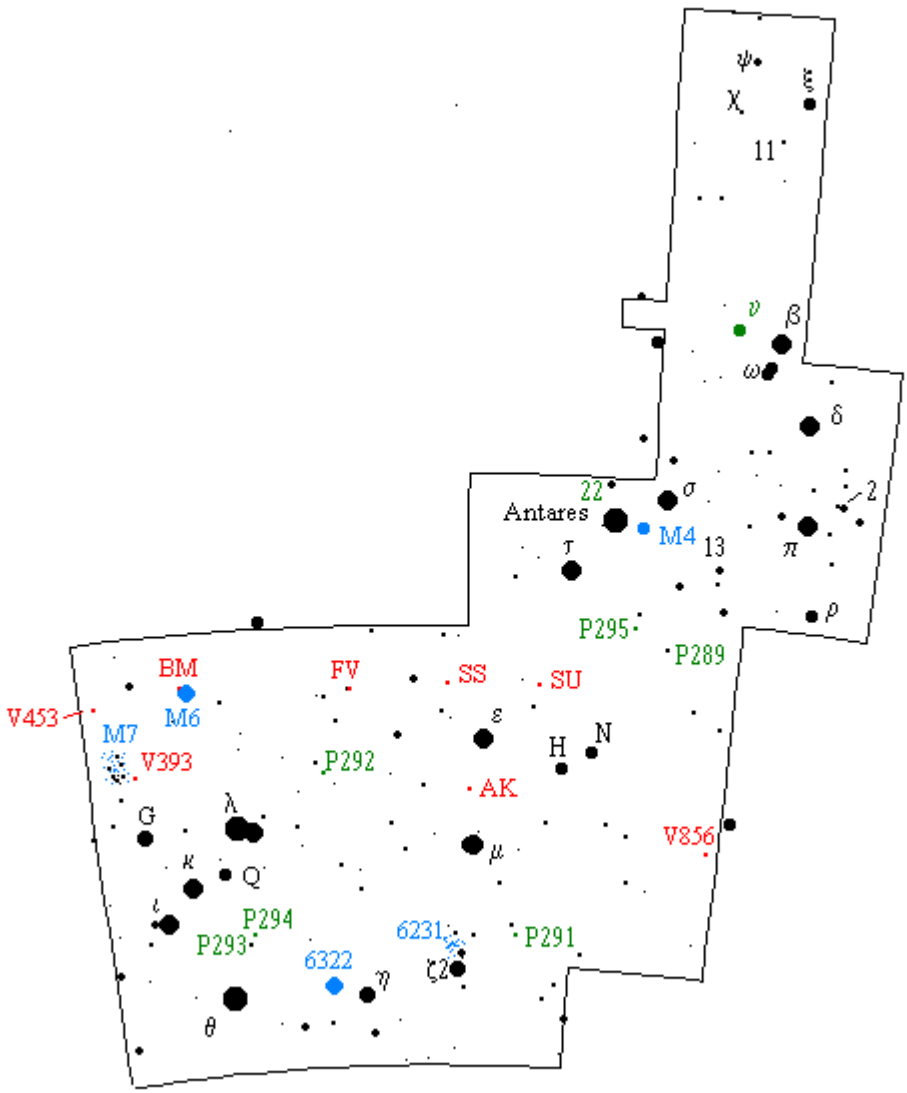
M.55 (NGC 6809). Another globular, much brighter, but more isolated.

NGC 6530 Many stars are visible in this cluster, which lies in a really beautiful region.

NGC 6716 Again, some stars can be resolved, before a white glow.

SCORPIUS

Chart



Like the previous constellation, this is a magnificent group in every possible way. Also alike insofar as you need altitude to appreciate its best objects!

Groups of stars

1. π (3.0), is one corner of a large, bright lozenge.

2. Bright quadrilateral formed by ξ , 11, ψ and χ .

3. The "sting" is extremely beautiful with any optical aid. Its brightest star is λ (1.7).

Wide doubles

2 and 3. A wide but rather unequal pair in group (1).

ω . A bright pair in a brilliant field.

$\mu^{1,2}$. A similar beautiful pair.

ζ^{2}. This star has two distant companions.

Close doubles

ν . Two stars separated by 41".

22. A closer, fainter pair near Antares. Mags 5 and 7.

P.289. This is a good test object for average-to-large glasses, of magnitudes 5.7 and 7.7 but only 24" distance.

P.291. A beautiful equal pair, 96" apart.

P.292. Again equal, but 2 magnitudes fainter, the 8th-mag stars being 88" apart.

P.293. Rather closer at 65 seconds, but slightly brighter.

P.294. This seventh-magnitude pair is wider (162") and easy.

P.295. A fainter object, 217 seconds apart.

Variable stars

SS (7.5-9.5) An irregular variable of the orange type K. A chart is supplied.

SU (8.0-9.4) This rather faint red star makes a right-angle with two stars of 5.9 and 6.5. Between the latter and SU lie two useful stars of 8.6 and 9.2.

AK (7.8-9.3) A nebular variable near mu. A chart is supplied.

BM (6.0-7.9) Though brighter, this is difficult to estimate as it is in the brilliant cluster M.6

FV (8.0-8.7) An Algol-type star, south of which is a vertical Y of (North to South) 7.9, 7.8, 8.3 and 8.6.

V393 (7.4-8.3) Near the wonderful cluster M.7, this eclipser is one of a small right-angle whose other stars are 7.2 and 7.8m.

V453 (6.8-7.3) Another eclipsing star, this time of the β Lyrae type. A fifth-magnitude star nearby forms a triangle with two to the E., of 6.8 and 7.0.

V856 (6.8-8.0) A nebular variable, and a wide double. Its companion is of 6.7m and is found directly to the N. A useful little right-angle lies just SW of the variable. Its members are of 7.0, 7.6 and 8.0m.

Clusters and Nebulae

M.4 (NGC 6121). A large globular cluster, quite bright and conveniently close to Antares.

M.6 (NGC 6405). A beautiful coarse cluster that binoculars will partially resolve into about a dozen stars.

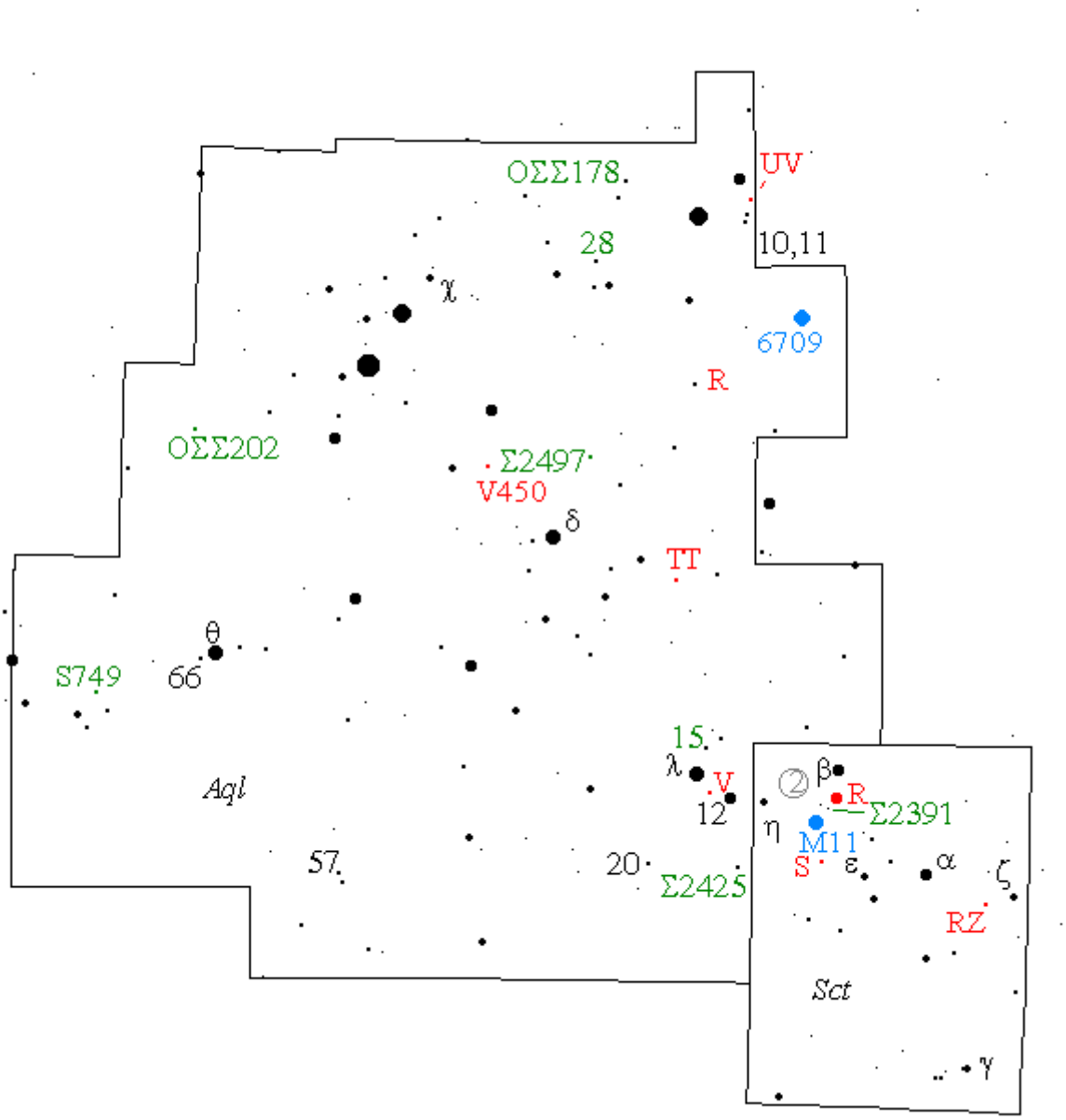
M.7 (NGC6475). This is one of the most superb of all binocular objects. Easily visible with the eye, your bins should reveal around 20 stars here.

NGC 6231 A cluster which streams out towards ζ , this is yet another showpiece of the Scorpion.

NGC 6322 This appears as five stars in a Y-shape before a misty patch.

SCUTUM

Chart



Although a small group, this contains some interesting objects in addition to the brilliant star-cloud easily visible to the naked eye. Many of the more recent constellation figures had double-barrelled names, such as Columba (formerly *Columba Noachii*, or Noah's Dove) or Sculptor (ex *Apparatus Sculptoris*, the Sculptor's Tools). Scutum was another of these, its former name being *Scutum Sobieskii*, named after a Polish nobleman. (That's a nobleman from Poland, not a chap who got rich quick from selling furniture-buffing products...)

Groups of stars

1. Long trail extending from the variable R, to the 4th-mag. α .

2. 18h 51m, -04°45'. Group of 8-9m stars in the form of a 7. A small line stretches from here to 7 and 8 Aquilae.

3. γ (4.7). A fine region E., including a red star.

Wide doubles

ε . A star with a fainter companion to the SE.

γ . This star has a bright associate closely E of it.

Close doubles

Σ2391. A faint, rather hard pair. Magnitudes 6 and 8, 38" apart.

Variable stars

R (4.5-8.4) A well-observed RV Tauri star which has been studied by amateurs for many years. It has recently emerged that this star displays chaotic behaviour, and those amateur observations, made by members of bodies such as the AAVSO, BAA and so on, are proving very important - a good example of how one branch of study feeds into another, this time amateur astronomy providing food for the Mathematicians. Why not have a look yourself - you'll get a bonus view of the "Wild Duck" as well. R Scuti is one of a little quadrilateral (other stars are 6.1, 6.7 and 7.1m).

S (7.0-8.0) A deep red star; one of a flattened pentagon whose other stars are of (E to W) 7.0, 7.0, 7.3 and 7.9.

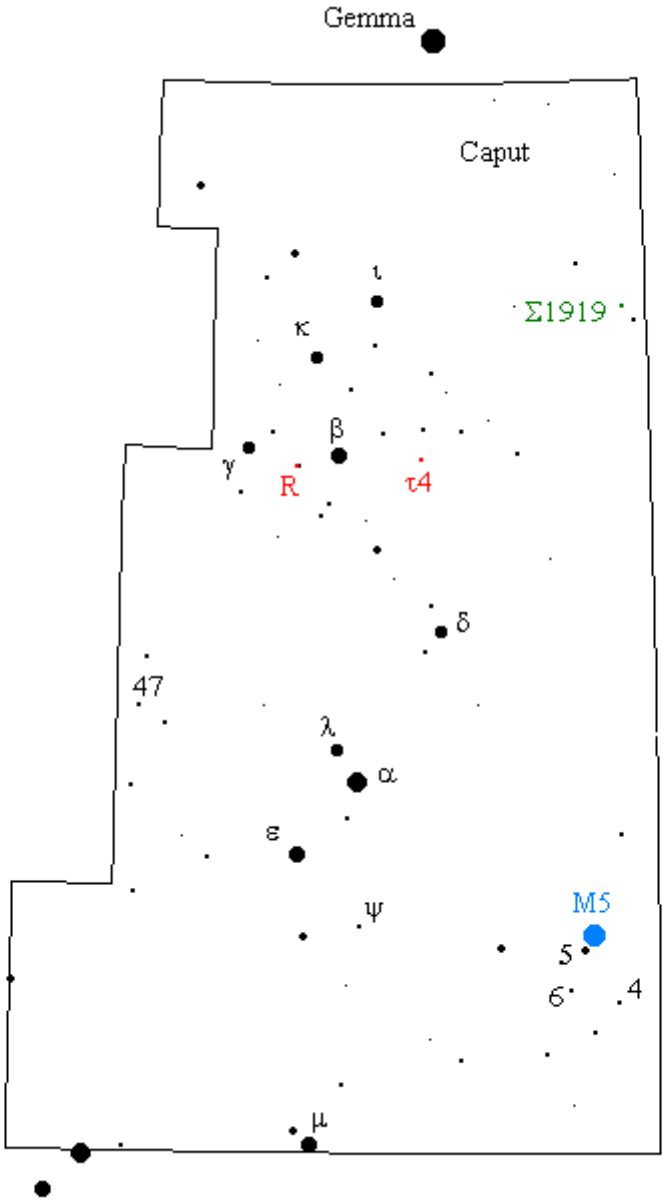
RZ (7.9-9.0) I have provided a chart for this eclipsing binary.

Clusters and Nebulae

M.11 (NGC 6705). A bright cluster visible as a hazy triangular patch. In small instruments, it well-deserves its nickname of the Wild Duck - it really does look like a flock of ducks flying in a V formation, with a brighter orange star near the centre.

SERPENS

Chart



The only double constellation in the sky, made up of Serpens Caput (the head) and Cauda (the tail) though objects are named as though the group were one. The idea is that Ophiuchus, who is struggling with the snake, has pulled the poor thing in half! That aside, Serpens contains many fine fields, notably in the E.

Groups of stars

1. Sweep the "head" of ι, β , γ and κ. The last of these is reddish. There is another fine region just W, where there are no less than 8 stars bearing the Greek letter τ !

2. The area of 4, 5 and 6 is worth scrutiny with larger glasses.

3. ζ . This makes a neat triangle with two fainter stars.

4. η (3.4) is in a rich field of bright stars.

Wide doubles

ψ . This 5.8m star has two fainter associates.

47. A red star with two fainter companions, one of which is FQ Ser, slightly variable.

ξ . A bright pair, though separated by three mags.

64. An attractive equal double, both 6m.

Close doubles

Σ1919. Rather hard for binoculars, with a distance of only 25". The mags are 6 and 7, and this is said to be a coloured pair. How do they appear to you?

θ . Not normally considered to be a binocular double because of its rather small separation of 22", this is a superb equal pair which I have to say I find reasonably easy with 10x50s.

Variable stars

τ^4. (5.9-7.0) A red star in the "tau's" and well-served with comparisons; τ^1 is 5.5, τ^2 is 6.1 and has two neighbours of 6.7 and 7.6.

R (6.7-13.4) A Mira star easily found between β and γ . Its period is very nearly a year to the day, and I have supplied predictions for it. R Ser is one of a regularly-spaced line of three (other stars are 7.3 and 7.4) and its redness at maximum will distinguish it.

Clusters and Nebulae

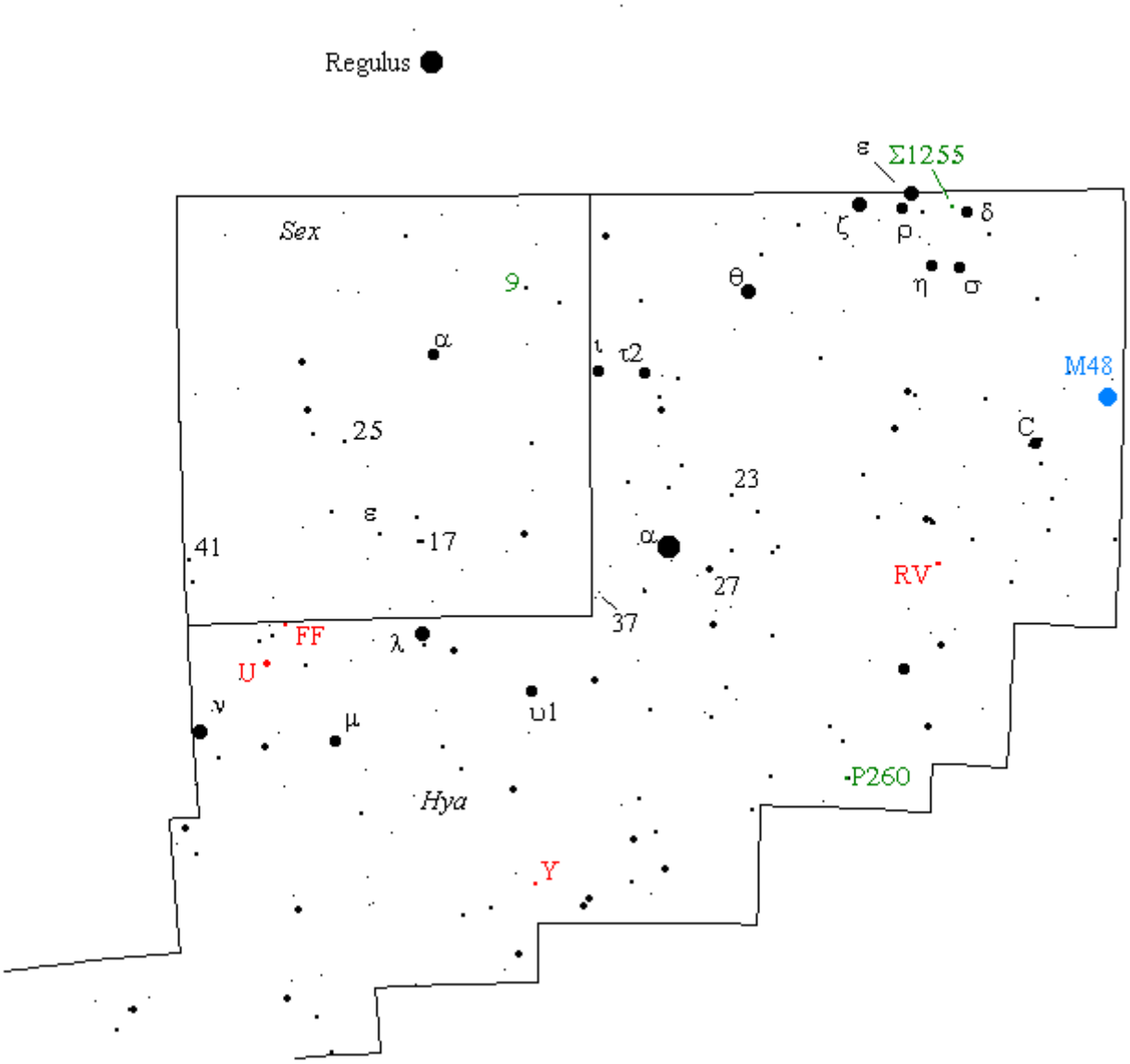
M.5 (NGC 5904). A large, blazing globular near the 5m star 5 Serpentis. A real bunch of fives! With small glasses, a bright nebulous star.

IC 4756 This is a really splendid cluster, appearing as a double row of stars of assorted brightnesses. The southern branch is more noticeable; a good object to try and draw.

M.16 (NGC 6611). Long-exposure photographs of the *Eagle Nebula* have become practically *de rigueur* in space documentaries, science-fiction movies and the like. The Hubble Space Telescope recently provided breathtaking pictures of this object as a giant stellar nursery, inside which one could lose the entire solar system with no difficulty at all.With giant telescopes it really is impressive of course, though the binocular observer will have to be content with rather less. Using 10x80 glasses Imre Toth says of it "the North edge is the brightest part, silver-grey in colour". There is also an attendant cluster, some stars of which you may see.

SEXTANS

Chart



A small, faint group below Leo, with few objects of interest

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Groups of stars

1. ε (5.4) is in an attractive region of fairly bright stars.

2. 25 (6.1) lies in an area scattered with wide pairs.

Wide doubles

17 and 18. An attractive red and blue object, good for small bins.

25. About 1° south is an equal (7.0m) wide double.

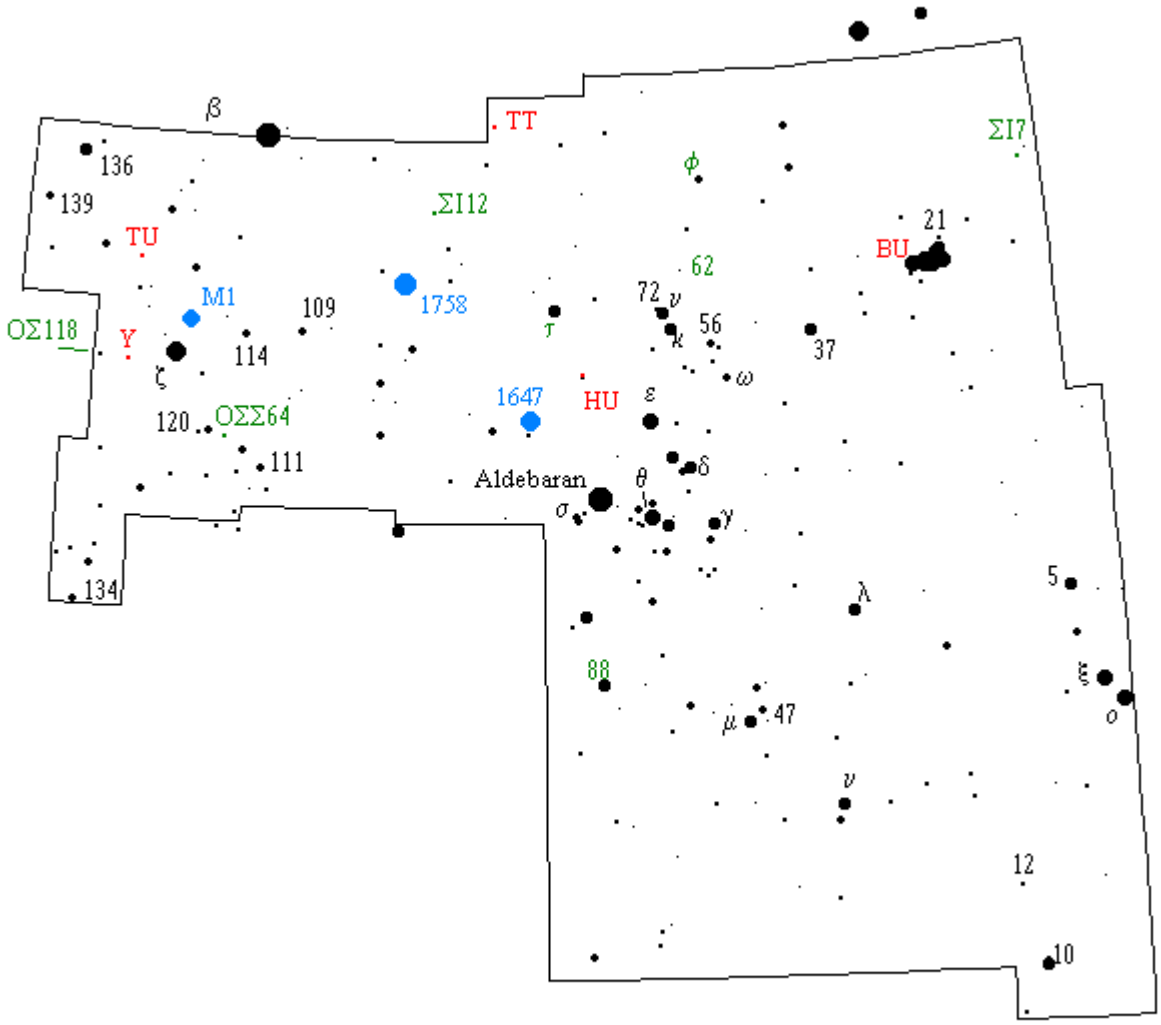
41. Note an 8th-mag companion SW. A fine field with large glasses.

Close doubles

9. A faint but wide pair. Mags 6 and 9, distance 52". Primary is red.

TAURUS

Chart



A splendid group, containing two spectacular clusters in addition to a host of interesting objects of all types. Its leader, Aldebaran, the eye of the bull, is a suitably angry red, with the Hyades cluster as a sparkling background. Taurus has everything for the binocular observer; beautiful wide double stars, interesting variables, and several notable clusters.

Groups of stars

1. Fine, brilliant group that includes μ (4.3) and 47 (5.0).

2. Small oblique cross of ω , 51, 53 and 56. Note a small circlet to the East.

3. Not far away is another singular bright group of κ , 67, υ and 72.

4. The Hyades. Note especially the numerous wide pairs and triples around this area. A good first object to draw; begin with the two faint lines marking the arms of the V, then add the stars. Note that another arm extends southwards from Aldebaran, making the famous V into a not-so-famous N!

5. Brilliant, long, meandering line beginning at 120 and ending at 134.

6. Slightly SE of 12 (5.8) is a tiny "cluster" of four stars.

Wide doubles

21 and 22. A white, unequal pair in the Pleiades.

27 and BU. BU is Pleione, in the Pleiades, and is said to be one of the few single stars that are noticeably purple in colour, though it always looks white to me.

37. This forms a wide pair with 39.

$\theta^{1,2}$. A beautiful naked-eye pair in the Hyades.

$\sigma^{1,2}$. Another beautiful wide pair. A third star is visible.

10. This has a fainter companion to the N, which is in fact a small-range variable, V711 Tau.

Close doubles

Σ I 7. A 7th-magnitude pair 44" apart.

ϕ . Difficult, because of the magnitudes of 5 and 9. Distance is 53".

62. Another unequal pair, this time of magnitudes 6 and 8 with a distance of 29".

88. Easier though still unequal; mags 4 and 7, 69" apart.

τ . Distance in this case is 63" and the mags are 5 and 7.

Σ I 12. An easy pair of 6m and 7m, 78 seconds apart.

OΣΣ 64 This 8th-magnitude pair are 76" apart. A fine field.

OΣ 118 The distance is the same, but the stars rather brighter (6m and 8m).

Variable stars

Y (6.8-9.2) This variable forms a triangle with two stars of 5.9 and 7.2, the latter with a 7.9m neighbour. Three other stars of 8.1, 8.6 and 9.4 lie just to the West. A satisfying star to observe, its deep red colour aiding identification.

TT (8.1-8.8) South of this deep red star is a straight line of 7.3, 7.5 and 8.1. The central of these has a companion of 8.8m.

TU (5.9-9.2) Another deep red star. I have provided a chart.

BU (5.0-5.5) Pleione is a hot irregular variable known as a *shell star*, though its range of only half a magnitude and its slow changes do not make it the most suitable type of variable for amateur observers. Use 16 (5.5) as a comparison star.

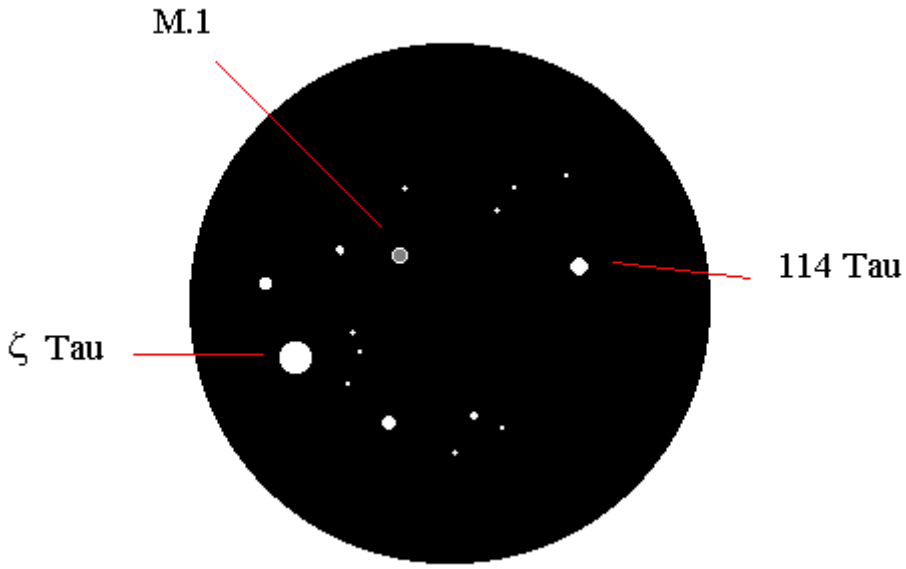
HU (6.0-6.8) An eclipsing binary for which you can use a wide pair to the southeast (6.6 and 7.2.)

Clusters and Nebulae

M.45. The Pleiades are visible in their true glory only with binoculars, which are also useful for revealing the faint nebulae that reflect the light of the hot stars nearby. The area around Merope (23 Tau) is especially bright, though as with all nebulae, any haze or mist will ruin the view. I once did an observational project on the appearance of the Pleiades nebulosity and came up with the conclusion that it was by no means standard from one night to the next. This does not of course mean that the nebulosity actually changes, however - just the observing conditions!

The Pleiades, by their beautiful appearance, have awed all those who watch the sky since time out of mind: and are known by names as diverse as the cultures which bestowed them, witness the following selection of epithets - a bunch of grapes, speckles of dust, the little turkeys, the little nanny-goats, or the hen and chickens; but we probably know them best as the seven sisters, in Greek myth the daughters of Atlas. By name they are Merope, Alcyone (the brightest Pleiad) Celaeno, Electra, Taygete, Asterope and Maia. Beautiful names for beautiful stars.

M.1 (NGC 1952). This is the *Crab Nebula*, remnant of a star that went Supernova several thousands of years ago and seen in 1054 by Chinese astronomers, among others. It is very interesting from the astrophysical point of view and indeed it has been said that there are two sorts of astronomy - the ordinary sort and Crab Nebula astronomy! It is a testing object for binoculars so I have provided a chart to help you find it.

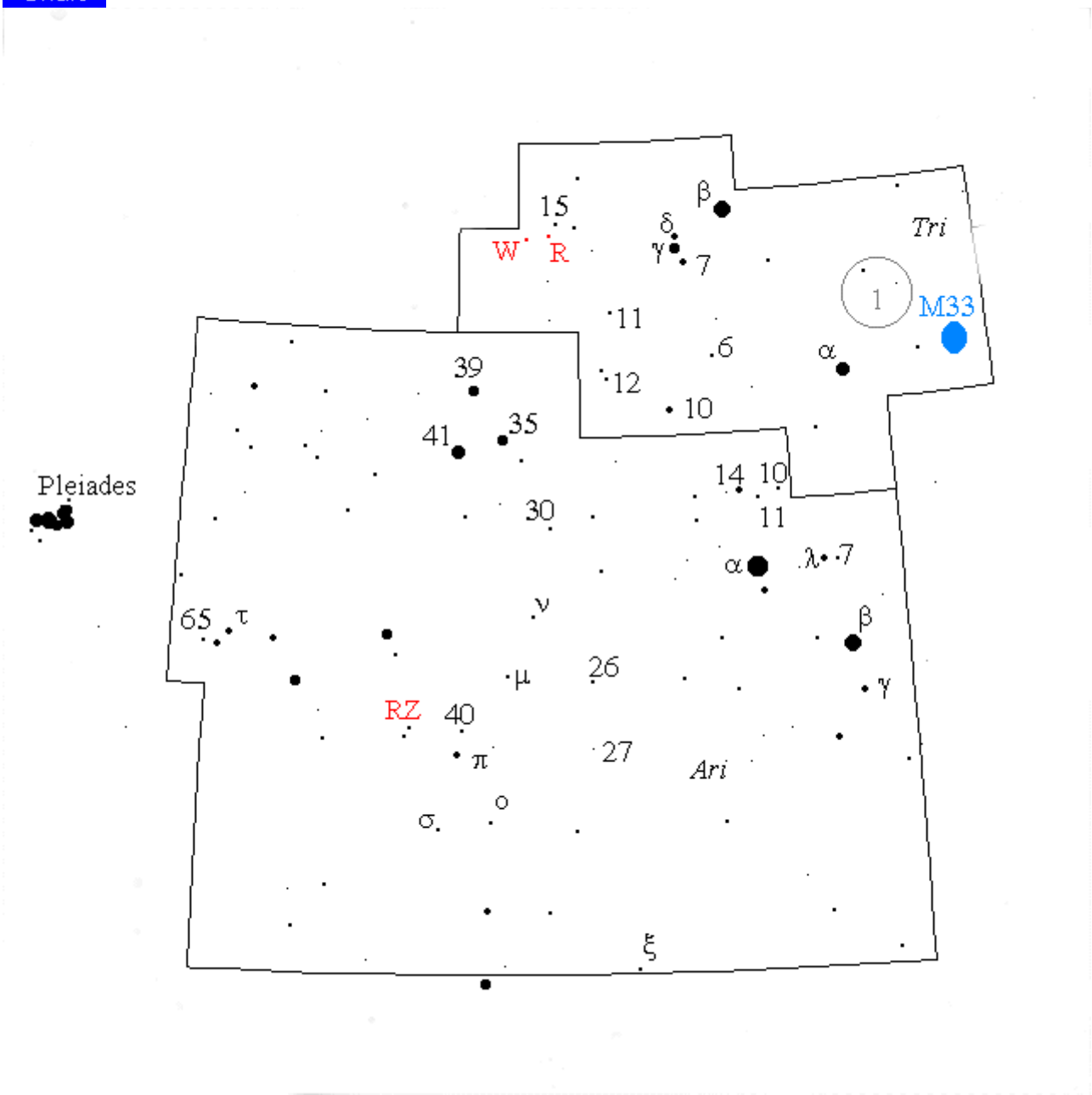


NGC 1758. A large cluster of faint stars, quite impressive in large glasses, where its brighter members are seen to form a kind of S-shape.

NGC 1647. This is a large, fairly bright cluster that reveals some of its 30 stars to the binocular.

TRIANGULUM

Chart



A small but readily-spotted constellation containing some good fields, notably near the borders with Perseus.

Groups of stars

1. 01h 45m, +32°. Small isosceles triangle with a group of seventh- and eighth-mag stars to be seen just to the North of its southern member.

2. Sweep within the trapezium formed by 6, 10, 11 and 12.

3. 15 (5.6). Good sweeping SW of this red star, including the LPV R Trianguli (see below).

Wide doubles

γ . Together with 7 and δ this makes a fine, wide triple for small glasses.

12. A star with three fainter acolytes, one of which is 13 (5.9).

15. Lies in an area of many wide pairs.

Variable stars

R (5.8-12) 15 Trianguli nearby makes a good comparison for this popular variable when at maximum, which occurs on average every 267 days. Predictions for R Tri are included in the appendices.

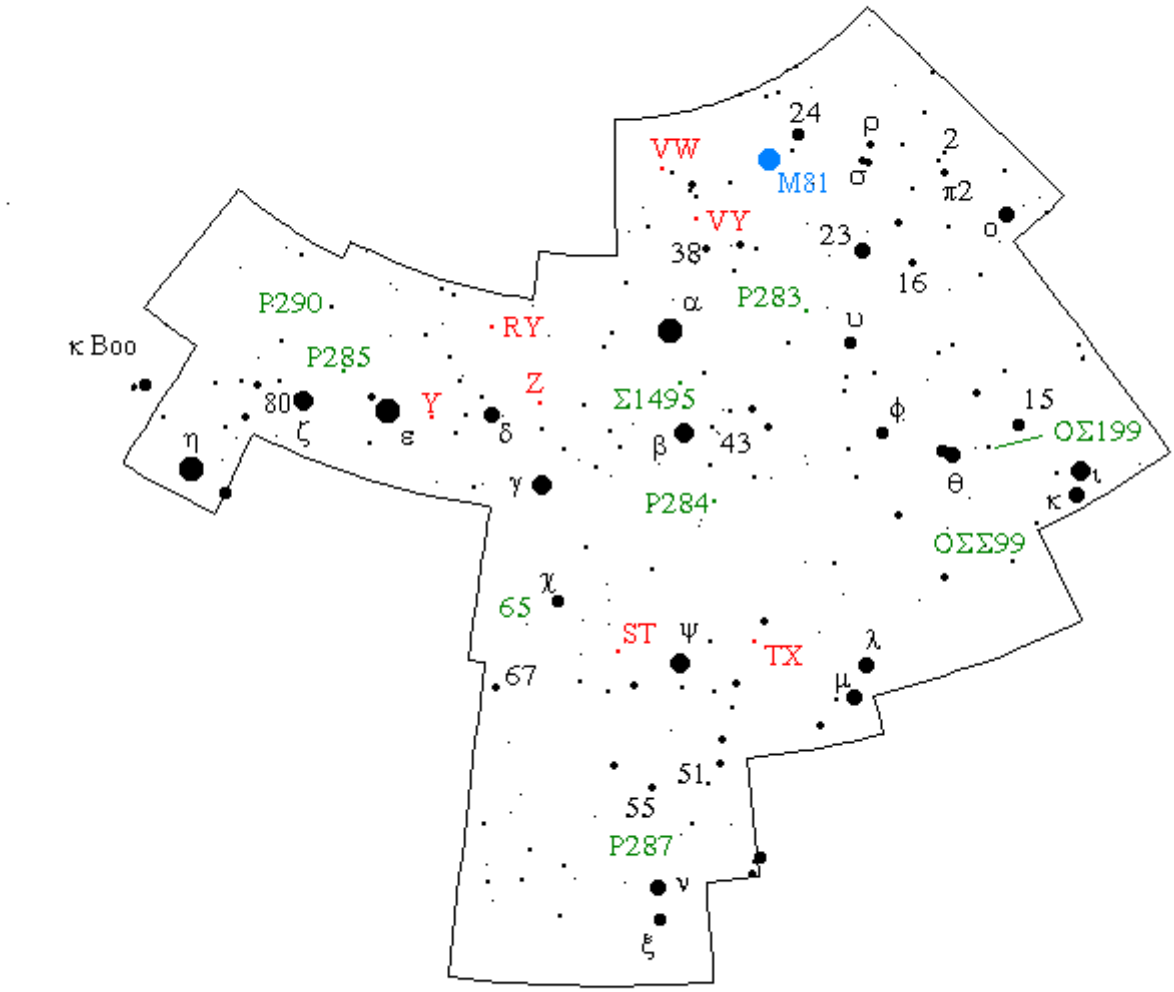
W (7.5-8.8) A red star in the same field. It lies between two comparisons of 8.1 and 8.4. If R is visible, why not observe them both together. Do you see any difference in their colours?

Clusters and Nebulae

M.33 (NGC 598). A large, isolated galaxy, visible to binoculars as a round spot, brighter in the centre than at the edges. On one occasion I have glimpsed it with the naked eye. Its light is spread out over a large area, so it looks very pale.

URSA MAJOR

Chart



The most famous constellation in the sky is much larger than is popularly thought, extending far beyond the "seven stars in the sky", the Plough, Big Dipper or Charles' Wain as it is variously known. The last of these names is interesting, referring not to King Charles as many think, but quite the opposite - the Churl's Wain or peasant's cart! Be that as it may, the Plough has been used since time immemorial to help sea-voyagers and lost wayfarers navigate. An old mariner's rhyme runs:-

Where yonder radiant hosts adorn the Northern evening skySeven stars, a splendid glorious train, first fix the wandering eyeTo deck great Ursa's shaggy form, those brilliant orbs combine

And where the first and second point, there see Polaris shine.

Groups of stars

1. Small, bright triangle of 2, π^1 and π^2. Fine sweeping between this group and the regular triangle of ρ , and$\sigma^{1,2}$. Note a tiny tick-shaped collection of stars a degree SE of π^2.

2. Large, bright fan of stars including 38 UMa.

3. Sweep the bowl of the Plough, noting that the nearby 43 (5.8) is just North of a small faint line, rather angular in shape.

4. Beautiful bright trail stretching from Mizar to κ Bootis.

5. 51 (6.1). Note that a star 2° to the Southeast is the southern member of a regular figure-seven shape, and also has a close pair to its own South-East.

Wide doubles

16. This has a companion NE which is in turn a close pair - Struve 1315, a 7th-magnitude double some 25 seconds apart.

67. Binoculars show one, possibly two, companions.

ζ and 80. This is of course Mizar and Alcor, the well-known naked-eye pair. You can even see Alcor when it is low in the sky, and Mizar itself is also double (2.1,4.2; 14") and has been split with a good pair of 12x40 binoculars. You may in addition see another star between Mizar and Alcor called at one time *Sidus Ludovicianum* or "Ludwig's Star", named regrettably not after Beethoven, but by a loyal subject of King Ludwig, who thought he had discovered a new star! (That's the subject, not mad King L.)

55. A 4.9m star with a 7m companion.

Close doubles

Σ1495. This lies between the pointers, Dubhe and Merak, and is 36" apart with a bright star to either side.

OΣΣ 99. A wide pair in a barren area. Mags 6 and 8, distance 80".

OΣ 199. A rather hard object; mags 6.6 and 8.3, distance 230".

P.283. Though the companion is quite faint at 8.3, this is a wide pair (187")

P.284. A beautiful object; both stars mag 6 and orange. Easy at 221 seconds.

65. Another fine sight, similar to the previous star, though closer (63").

P.285. A difficult double of 6.7 and 8.2, 98" apart.

P.290. Difficult again; mags 5.4 and 8.2, though twice as wide as P.285.

P.287. Rather easier at 146" and magnitudes 6.3 and 7.6.

Variable stars

Y (7.6-9.5) A red star not far from Alioth, the *lucida* of the Plough. It lies right between two useful stars of 7.9 and 8.2, though large glasses are needed to follow it around minimum.

Z (6.6-9.1) This well-observed and interesting star is in a faint little X whose mags are (from N to S) 8.8, 8.7, 8.6, 8.8. A brighter star of 7.2 lies between Z and Megrez, the faintest star of the dipper, though some believe this star may have faded somewhat over the course of centuries.

RY (7.0-8.0) An easy star to find, one of a small Y whose other stars are of 6.9, 7.4 and 7.8m.

ST (6.4-7.5) This bright red star is ideal for the beginner, though rather hard to find initially. It is the most Northerly of a distinctive, small vertical line of three whose southern member is 6.9m.

TX (6.9-8.5) This eclipser lies near a star of mag.5, with a companion of 8.1m. A degree North-East of the bright star is another comparison of 7.3m.

VW (7.2-7.8) A red star, for which a little triangle some distance to the Northeast can be used (6.9, 7.3, 8.0). VW further lies between two 6m stars and has a southerly companion of 7.6m.

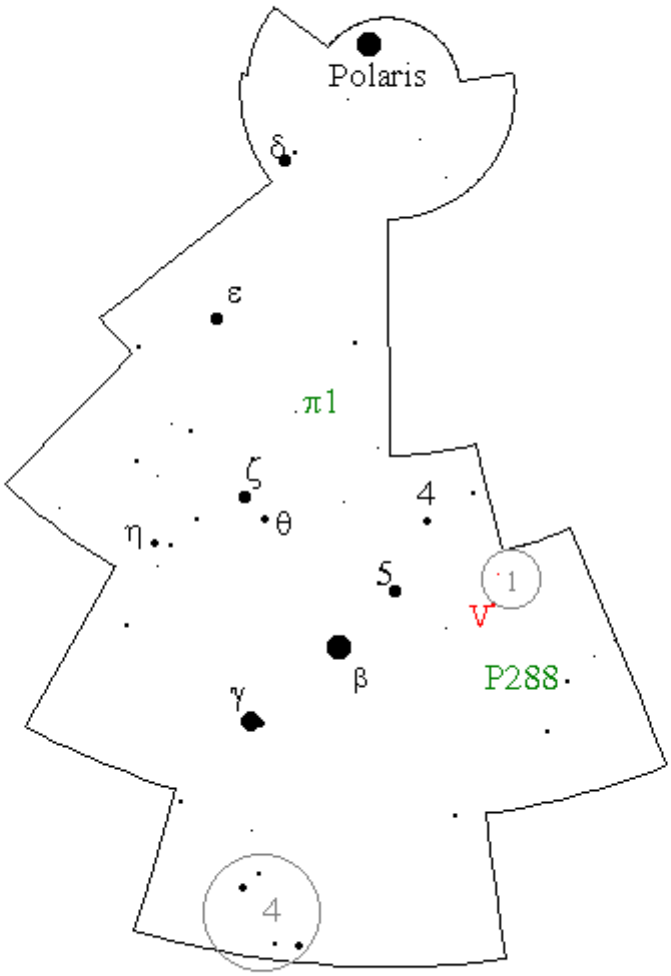
VY (6.0-6.6) A deep red star, good for the beginner with small glasses, though rather poor in light-range. Use the long triangle to the East of 6.1, 6.5 and 6.7. As with most stars of this class (the red Irregulars) it needs observing only once, or, in case of interesting behaviour, twice a month.

Clusters and Nebulae

M.81 (NGC 3031). A galaxy readily seen in average bins. You may also see its fainter neighbour M.82. In 1993 a Spanish amateur discovered a Supernova in M.81 that has proved to be one of the most interesting explosions yet observed. Although 1993J as it was called never reached binocular visibility, this is still a good example of what an ordinary observer can achieve.

URSA MINOR

Chart



Some notable red stars, but really not much besides, at least for the observer using binoculars.

Groups of stars

1. 13h 36m, +77°. Small arc of five, with some fainter associates.

2. Sweep along the line of 4, 5 and β . They are all reddish stars.

3. η . Lies in a beautiful field, with some coarse groups of stars.

4. 15h 00m, +67°. Bright quadrilateral, of which the senior member is the variable RR UMi, a small-amplitude red star of magnitude 5.

Wide doubles

γ . This has a red companion, 11 (5.1).

β . A degree to the North is a bright, wide double.

Close doubles

π^1 . Magnitudes 6 and 7, distance 31". Quite easy.

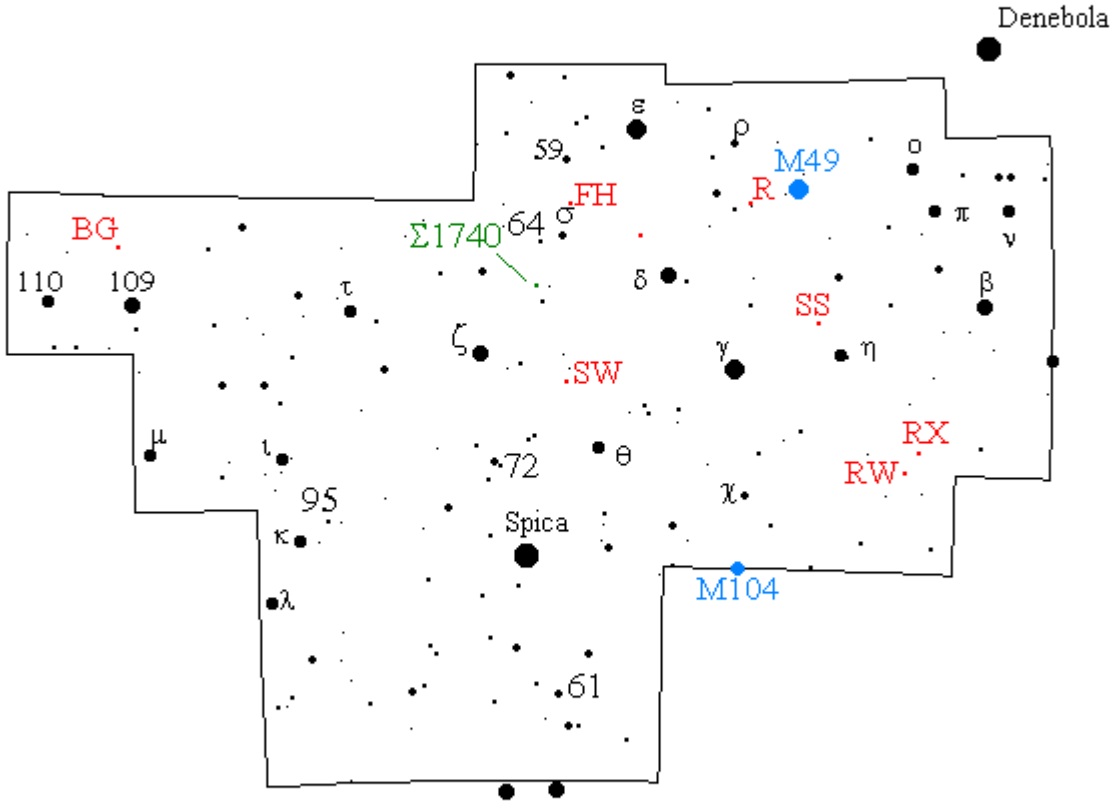
P.288. A faint, obscure pair of 7.5 and 8.4. Separation 210".

Variable stars

V (7.4-8.8) Found near group (1), this is the southern member of a small isosceles whose other stars are 7.8 and 8.1m.

VIRGO

Chart



A large group with some good fields and several nice variables. Its most notable claim to fame is the vast collections of galaxies which inhabit it, though only a very few of these are binocular objects.

Groups of stars

1. Sweep from σ towards ζ .

2. Long arc, extending from 95 (5.5) to 72 (6.1).

3. ι . This lies inside a pretty triangle, with a fine cross to the W.

4. 61 (4.8) is the centre of a large, bright collection best seen with small bins.

Wide doubles

27 and ρ . An unequal, wide pair.

64 and σ . South of these stars is another wide 6m double.

Close doubles

Σ 1740. A close, equal double of the 7th magnitude, and 28" separation.

Variable stars

R (6.0-11.5) A mira star with the short period of 150 days. I have followed this star to mag.10 with a 7x50 finder - You will never know quite what your optics can do unless you push them from time to time! Predictions are supplied.

RT (8.0-9.0) A rather isolated and dim star

RW (7.0-8.2) There is a small triangle closely E of 6.8,7.6 and 8.8, and a 7.2m star near RW itself. RX, one degree away, is a similar type of star, but with a small range of only half a magnitude.

SS (6.8-8.9) An interesting star to follow, this makes a north-pointing triangle with two stars of 7.7 and 8.8. Observe once every 3 weeks.

SW (6.5-7.7) This lies between θ and a 6m star. SW Vir is the southern member of a little line of three (the others are 7.7 and 8.1).

BG (8.1-9.1) This, together with its neighbour of 8.9m, is the most northerly of a triangle of wide, faint pairs. The E. pair is of 8.4 and 8.9, and between BG and 109 (3.8) are two other stars of 7.6 and 7.9m.

FH (6.9-7.5) Though of small range, two stars near 59 Vir, of 6.9 and 7.2, are useful as comparison stars for this variable.

Clusters and Nebulae

M.49 (NGC 4472). A galaxy which appears as a faint gleam of light.

M.104 (NGC 4594). The "Sombrero Hat" galaxy is visible as an elliptical blur. The many other incredibly distant galaxies in this constellation are mostly very faint, but you could try sweeping slowly and carefully around the bowl of Virgo (that is, the area roughly bounded by δ and ε virginis and beta Leonis) for a glimpse of some of them.

VULPECULA

Chart

A really fine little group in the Milky Way, unfortunately rather shapeless. In fact there used to be two constellations here; the other was predictably *Anser*, the Goose - it is no longer officially in the sky, but presumably in the Fox's tum instead!

Groups of stars

1. 4 (5.3) is the leader of a brilliant little group known as the "Coathanger" from its shape - which may look more realistic in an inverting optical system such as many finderscopes are. In ordinary binoculars, you will have to conceive of an upside-down coathanger!

2. 18,19 and 20. 19 is surrounded by three faint stars, while some members of the open cluster NGC 6885 may be seen around 20. Very fine field.

3. 29. This is surrounded by beautiful faint groupings.

Wide doubles

α . This has a companion of 6.0m. Additionally, the interesting open cluster NGC 6800 lies nearby.

16. Another star with a 6th-mag. attendant.

32. Two, maybe three companions may be seen here.

Close doubles

OΣΣ 181. Right on the border with Lyra, these stars are both of 6.5m. A fine object.

Σ I 48. Another equal 6th-magnitude pair, but thirteen seconds closer at 42".

Variable stars

V (8.1-9.4) Most good binoculars should be able to follow this interesting member of the RV Tauri class, easily located close to the 5.5m star 27 Vulpeculae. The variable lies exactly midway between this star and a faint comparison of 9.3 magnitude situated half a degree Northwest of 27 Vul. A brighter star of 8.6 magnitude forms an isosceles triangle with V Vul and 27. Observe this variable once a week, since its period is only about 75 days.

SV (7.5-9.4) A golden-yellow Cepheid with the long period for these stars of 45 days, which by the period-luminosity law (i.e.,the longer the period of a Cepheid the more luminous it is),means that here we have a very powerful star indeed. A chart is supplied for it, and also the similarly-coloured S Vul not far away, which is a small-amplitude

semiregular variable, not so very dissimilar in fact from the Cepheid variable close by, other than the fact that its variations are not quite so predictable.

DY (7.0-7.7) Just to the North is a star of 7.5, while directly North of 33 Vul is a brighter comparison of 6.7. A red variable.

FI (7.6-9.1) An irregular line of 7.4, 7.3 and 9.0 lies to the W, and a star of 8.5m is North-East. The field can be found by means of a wide pair of 6.9 and 7.2.

Clusters and Nebulae

Cr.399. This is the Coathanger, mentioned above. It was near here in 1976 that George Alcock, the famous amateur, discovered another of his many novae. This was no flash in the pan, however; for many years he had been watching the skies, learning the patterns of hundreds of stars along the Milky Way, an approach now copied by the rest of the world's amateurs involved in the discovery of Novae. He used for these purposes not a powerful telescope, but *binoculars* - proof again that you do not need to spend large amounts of money on flashy-looking pieces of high-tech equipment to make a mark in the world of Astronomy - though you *do* need dedication, devotion and sometimes a bit of patience!

M.27 (NGC 6853). The dumb-bell nebula, this is readily visible as a large grey spot near the 5m star 14 Vulpeculae. You might like to search out this constellation for other open clusters not discussed above, chief of which is probably NGC 6885.

HANDBOOK OF BINOCULAR ASTRONOMY