

Objects in the Heavens

THE COMPLETE MAG-10
NORTHERN DEEP-SKY
VIEWING LIST
& FIELDBOOK

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PHOTOGRAPHY: NAOYUKI KURITA



THIRD EDITION

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PHOTOS by Naoyuki Kurita

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INTRODUCTION

What **ALL** can I see with my small telescope? And where is it?

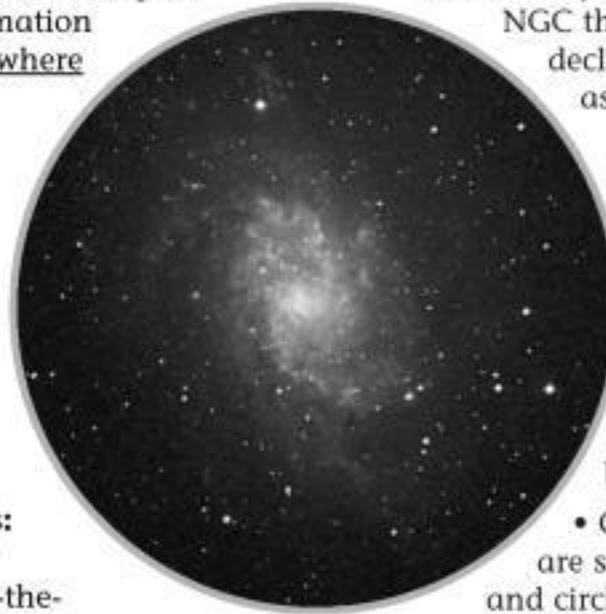
Hundreds of deep-sky objects are easily seen in a 6-inch or smaller telescope. Many of these are well-charted; others border on being 'hidden' from view because they aren't shown in the popular lists.

OITH brings together all the lists and all the objects of mag10 or brighter in a form that's convenient for use at-the-scope.

While not a tutorial, *OITH* provides ready information on the what and where of every deep-sky object known to mag10, those with the most potential for the average telescope and viewable from the north of the equator.

Unique features:

- Pocket-sized for immediate use at-the-scope or with binoculars.
- Opens flat to all pages.
- For sight-aligned or go-to scopes.
- All objects potentially viewable.
- Limited, logical abbreviations.
- Object-oriented maps.
- Readable at night by flashlight.
- Messier Marathon and other lists.
- Double stars for challenge and fun.
- Simple articles for the **beginner**.
- Details for the **advanced**.



How the book is organized:

The front part contains three tabbed sections: **general** information, **reference** lists and **seasonal** mag7 city objects maps. The constellation **listings** which follow are arranged alphabetically. Near the back of the book are pages for **sketching** and additional logbook notes (copy these as much as you like).

How the list pages are organized:

- Stars and double are listed first, followed by Messier objects, NGC then others in declining right ascension (RA).
- Each object is mapped across from its entry.
- Map symbols for object type and relative brightness.
- List symbol for binocular objects.
- Objects to mag7 are set bold in the lists and circled on the maps.
- Lists and maps are set larger type for easy reading by flashlight.
- Maps are sized to not cramp a constellation or overwhelm a page; they are not relative to one another.

Computerized telescopes have as many as 125,000 targets in their databases. Most objects in the computer are too dim for a 6" (or are only stars). Now focus on those deep-sky objects that actually have a chance of being seen.

Photo: M33, The Pinwheel Galaxy in Triangulum. Many galaxies, star clusters and nebulae are accessible in small telescopes and binoculars.

THE TRADITIONAL 88 CONSTELLATIONS

<i>Symbol</i>	<i>Name and Meaning</i>	<i># of Entries</i>	<i>Symbol</i>	<i>Name and Meaning</i>	<i># of Entries</i>
AND	Andromeda –Daughter of CAS	14	LAC	Lacerta – the Lizard	7
ANT	*Antlia – the Air Pump	1	LEO	Leo – the Lion	17
APU	Apus – the Bird of Paradise	-	LMI	Leo Minor – the Little Lion	2
AQR	Aquarius – the Water Carrier	8	LEP	Lepus – the Hare	6
AQL	Aquila – the Eagle	13	LIB	Libra – the Scales	2
ARA	Ara – the Altar	-	LUP	Lupus – the Wolf	2
ARI	Aries – the Ram	3	LYN	Lynx – the Lynx	4
AUR	Auriga – the Charioteer	20	LYR	Lyra – the Harp	10
BOO	Boötes – the Herdsman	10	MEN	Mensa – the Table Mountain	-
CAE	Caelum – the Chisel, the Burin	-	MIC	Microscopium–the Microscope	-
CAM	Camelopardalis – the Giraffe	14	MON	Monoceros – the Unicorn	41
CNC	Cancer – the Crab	6	MUS	Musca – the Fly	-
CVN	Canes Venatici – Hunting Dogs	17	NOR	Norma – the Square, Level	-
CMA	Canis Major – the Large Dog	25	OCT	Octans – the Octant	-
CMI	Canis Minor – the Small Dog	2	OPH	Ophiuchus – Serpent Bearer	31
CAP	Capricornus – the She-Goat	4	ORI	Orion – the Hunter	31
CAR	*Carina – the Keel	-	PAV	Pavo – the Peacock	-
CAS	Cassiopeia –Queen of Ethiopia	53	PEG	Pegasus – the Winged Horse	5
CEN	Centaurus – the Centaur	6	PER	Perseus – Rescuer of AND	28
CEP	Cepheus – King of Ethiopia	23	PHE	Phoenix – the Fire Bird	-
CET	Cetus – the Whale	8	PIC	Pictor – the Painter's Easel	-
CHA	Chamaeleon – the Chameleon	-	PSC	Pisces – the Fishes	7
CIR	Circinus – the Compass, Dividers	-	PSA	Pisces Austrinus – Southern Fish	-
COL	Columba – the Dove	4	PUP	*Puppis – Stern of Argo's Ship	56
COM	Coma Berenices – Berenice's Hair	21	PYX	*Pyxis – the Ship's Compass	3
CRA	Corona Australis – S.Crown	2	RET	Reticulum – the Net	-
CRB	Corona Borealis – N.Crown	3	SGE	Sagitta – the Arrow	5
CRV	Corvus – the Crow	4	SGR	Sagittarius – the Teapot	54
CRT	Crater – the Cup	1	SCO	Scorpius – the Scorpion	45
CRU	Crux – the Southern Cross	-	SCL	Sculptor – the Sculptor's Tools	9
CYG	Cygnus – the Swan, N.Cross	45	SCT	Scutum – the Shield	13
DEL	Delphinus – the Dolphin	5	SER	Serpens – the Serpent	8
DOR	Dorado – the Goldfish	-	SEX	Sextans – the Sextant	2
DRA	Draco – the Dragon	15	TAU	Taurus – the Bull	19
EQU	Equuleus – the Little Horse	1	TEL	Telescopium – the Telescope	-
ERI	Eridanus – the River	10	TRI	Triangulum – the N.Triangle	4
FOR	Fornax – the Furnace	9	TRA	Triangulum Australe – S.Triangle	-
GEM	Gemini – the Twins	19	TUC	Tucana – the Toucan	-
GRU	Grus – the Crane	-	UMA	Ursa Major – the Big Bear	23
HER	Hercules – Son of Zeus	11	UMI	Ursa Minor – the Little Bear	4
HOR	Horologium – the Clock	-	VEL	*Vela – the Sail of Argo's Ship	4
HYA	Hydra – Female Water Snake	12	VIR	Virgo – the Virgin	33
HYI	Hydrus – the Male Water Snake	-	VOL	Volans – the Flying Fish	-
IND	Indus – the American Indian	-	VUL	Vulpecula – the Fox	10
Total entries					875

Bold – N. Hemisphere viewable constellations. Others are in the far southern skies.

* In the 1800's, these constellations made up one named Argo Navis (the Argonaut's Ship), later subdivided to include: Antlia, Carina, Puppis, Pyxis, Vela and one no longer in use, Malus.

SYMBOLS & MEANINGS

Symbols and Abbreviations

HEADING TERMS	Meanings
Size	– Separation of double stars or dimension of an object.
on Meridian	– Overhead at 9pm.
RA/Dec	– Address, see page 13
Mag	– Magnitude, at right.

LIST SYMBOLS	Meanings
☆	– Single notable star.
☆☆	– Double or multiple stars.
○	– Telescopic object check box.
○○	– Binocular object checkbox.
Σ	– F.G.W. Struve (double stars)
NGC	– New General Catalog object; Others defined on page 20.
MLY	– Million Light Years.
E5/S0	– Galaxy types, see p.18.
Bold	– “City Objects”, binocular-class to mag7 ; circled on constellation maps.
Vertical line	– Close visual associates.

MAP SYMBOLS	OBJECT TYPES
<m7 >m7	Abbreviations and Meanings
◇ ○	OC – Open Cluster
◆ ○	C/N – Cluster with Nebulosity
◇ ○	GC – Globular Cluster
◇ ○	EG – Elliptical Galaxy
◇ ○	IG – Irregular Galaxy
◇ ○	SG – Spiral Galaxy
◇ ○	SG – Super Giant Star
◇ ○	DN – Dark Nebula
◇ ○	EN – Emission Nebula
◇ ○	ER – Emission/Reflection Neb.
◇ ○	PN – Planetary Nebula
◇ ○	RN – Reflection Nebula
◇ ○	SN – Supernova Remnant (M1)
◇ ○	AST – Asterism
★	STAR asterism designations: Small Telescope Asterism Roster

Magnitudes

Difference in brightness between successive whole numbers is a ratio of two and one half (2.51) times.

- 27 – Sun
- 14 – Full Moon
- 4.8 – Venus at its brightest
- 3 – Jupiter at its brightest
- 2 – Sirius, brightest star
- 1 – Betelgeuse
- 0 – Vega
- 1 – Spica, Deneb, Pollux
- 2 – Polaris, the North Star
- 3 – Megrez, faintest in Big Dipper
- 4 – α Centauri
- 5 – Cor Coroli
- Naked eye sky in the suburbs*
- 6 – Naked eye sky in the country*
- 7 – M52-CAS
- 8 – Neptune
- 9 – Limit of typical binoculars*
- 10 – Limit of a 60-mm telescope*
- 11 – Limit of a 3-inch telescope*
- 12 – Limit of a 4-inch telescope*
- 13 – Limit of a 6-inch telescope*
- 14 – Limit of an 8-inch telescope*

Pluto (about the glow of a candle seen from 200 miles)

* Assumed as dark a sky as possible

Miscellanea

680	Deep-sky objects to Mag10 .
189	Other-than Messier or NGC.
186	“City Objects” to Mag 7 .
145	Doubles and multiple stars.
136	Binocular-class objects.
106	Visual associate connections.
63	Object-oriented maps.
33	Observatory catalog sources.
19	Photos by Naoyuki Kurita.

PAGE ORGANIZATION

List Heading

1. Constellation name, common name(s) and abbreviation.
2. Seasonal map showing the constellation.
3. Time of year directly overhead at 9pm local time.
4. Description of constellation and area by Rev. T. W. Webb.

Identifier

5. Single star of interest.
6. Double or multiple star.
7. Telescopic object check box.
8. Binocular object check box.
9. Bold listing for mag 7, identified in seasonal maps, circled on constellation map.
10. List order: Messier (with its NGC#), NGC's, then others in ascending RA.
11. Object type.

Entry Details

12. Object descriptions in plain language as much as possible.
13. Common name in italics.
14. Number of stars in the object.
15. Size in degrees, arc minutes or arc seconds.
16. Right Ascension times and Declination degrees.
17. Magnitude, averaged from among various catalogs.

Constellation	Common Name	Seasons or Months	Abbreviation
Star Identifier	Details	Size RA	Dec Mag
Cygnus	the Swan, Northern Cross	Summer Sep 10	Cyg
<i>"This fine cruciform occupies a prominent position in the Galaxy, and its low-powered fields are overpowering in magnificence."</i>			
α Deneb	α 19th brightest, on north end	"fixed star" 1 2	
β Alberio	β Super-fine double @ 34" apart	south end	3.1-5.1
γ 1 Patriotic Triple	γ 1 Patriotic Triple, mag 3.8/4.8/6.7	20:13.6	46°42'
γ Sadr	γ The Swan's Breast, center of the cross		2.2
M29 6913	OC Weak, scattered 20	trapezoid 7	23.9 38°32' 6.6
M39 7092	OC Bright, scattered, 25	32 21:32.2	48°26' 4.6
NGC6811	OC Dense, large, pretty rich, 50	15 19:38.2	48°34' 6.8
NGC6819	OC Rich, 150 mag 11-15, faint	6 19:41.3	40°11' 7.3

Bayer/Flamsteed Designations – Star Ranking System

The Bayer Designation uses the Greek alphabet to identify brighter to dimmer stars within a constellation, like αHer, followed in declining order by the Flamsteed number designations, like 24Cam.

α – alpha	η – eta	ν – nu	τ – tau
β – beta	θ – theta	ξ – xi	υ – upsilon
γ – gamma	ι – iota	ο – omicron	φ – phi
δ – delta	κ – kappa	π – pi	χ – chi
ε – epsilon	λ – lambda	ρ – rho	ψ – psi
ζ – zeta	μ – mu	σ – sigma	ω – omega

STAR STORIES – CONSTELLATION GROUPINGS

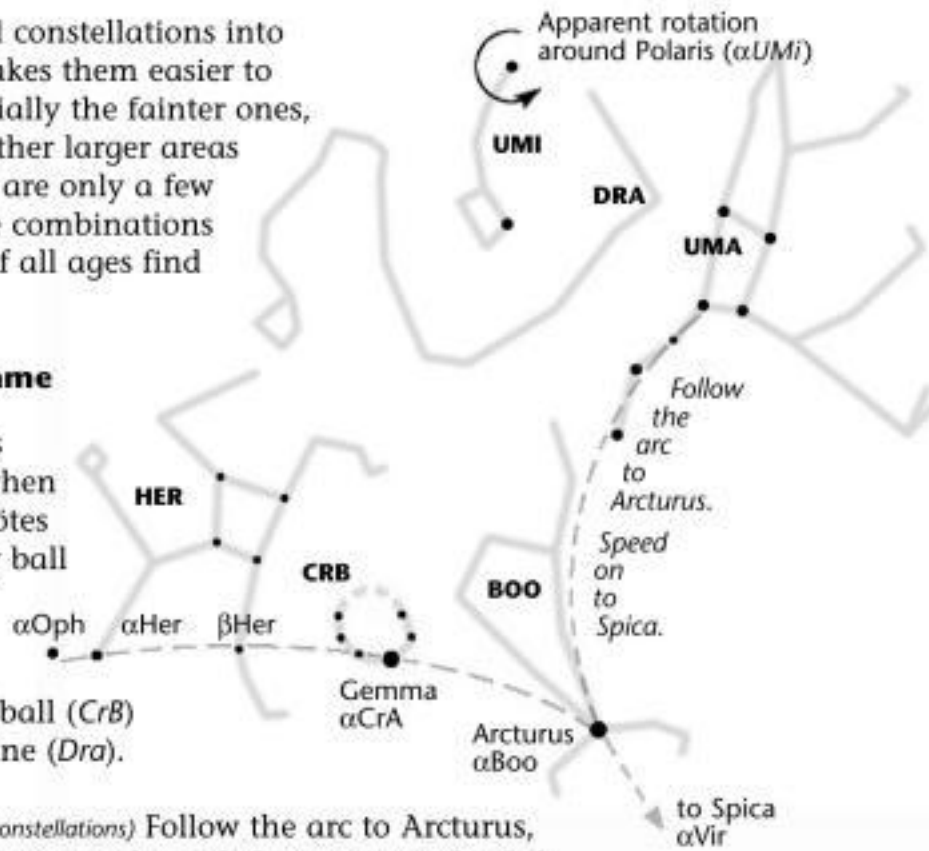
Stars and their patterns in the night sky have been used to tell stories since the beginning of human time. Names tell of real people, mythical creatures, events in history or inspired from literature. Traditional stories were handed down over hundreds of generations and are educational for all ages.

Grouping several constellations into a single story makes them easier to remember, especially the fainter ones, by bringing together larger areas of the sky. These are only a few of many possible combinations which children of all ages find entertaining.

The Football Game

(6 constellations)

The game begins in early spring when Hercules and Boötes come out to play ball with the Bears (UMA and UMI). Her and Boo are trying to get the ball (CrB) across the goal line (Dra).



The Big Bird (5 constellations) Follow the arc to Arcturus, then bounce to Gemma, through beta Her, alpha Her and alpha Oph.

The Summer Triangle

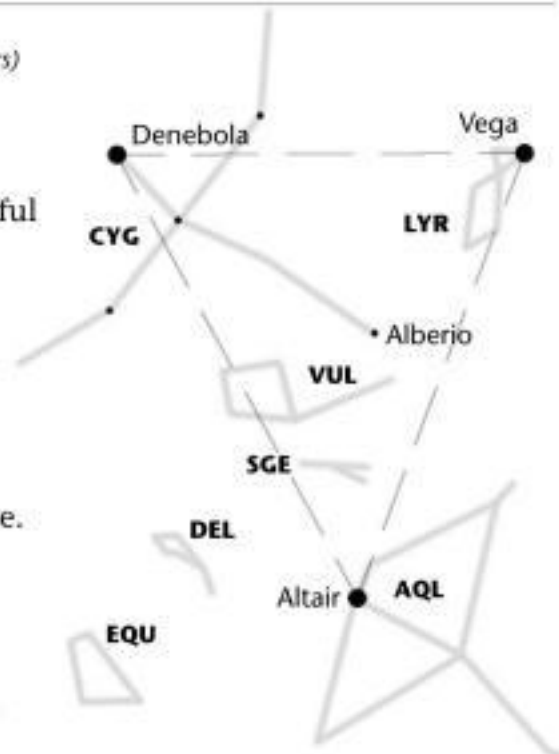
(3 constellations, 3 stars)
The main summer grouping (asterism) is the Summer Triangle which takes in Denebola (the alpha star in Cygnus), Vega (alpha Lyr) and Altair (alpha Aql). The beautiful double star, Alberio, is near the middle.

The Toy Store

(5 constellations)
Between Aquila and Cygnus is a line of small constellations that make up the Toy Store: Lyra, Vulpecula, Sagitta, Delphinus and Equuleus. These are the harp, kite, arrow, dolphin and little horse.

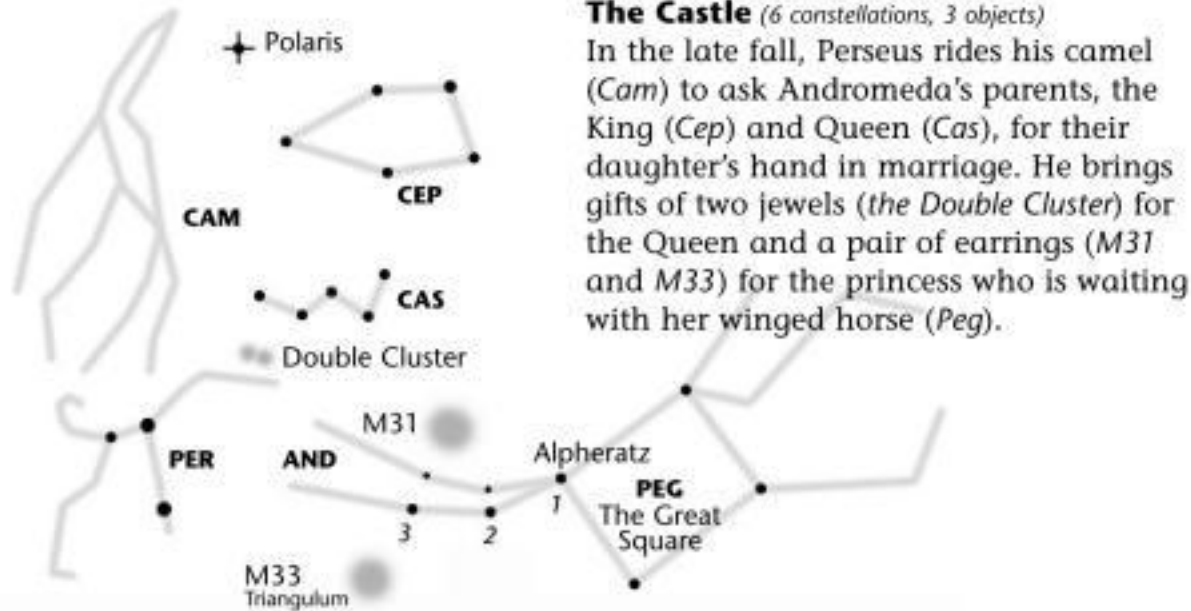
These short stories are fanciful ways of making connections. They are not meant to replace traditional or historic references.

alpha – alpha, usually the brightest star of each constellation.



10 Groupings

STAR STORIES – CONSTELLATION GROUPINGS

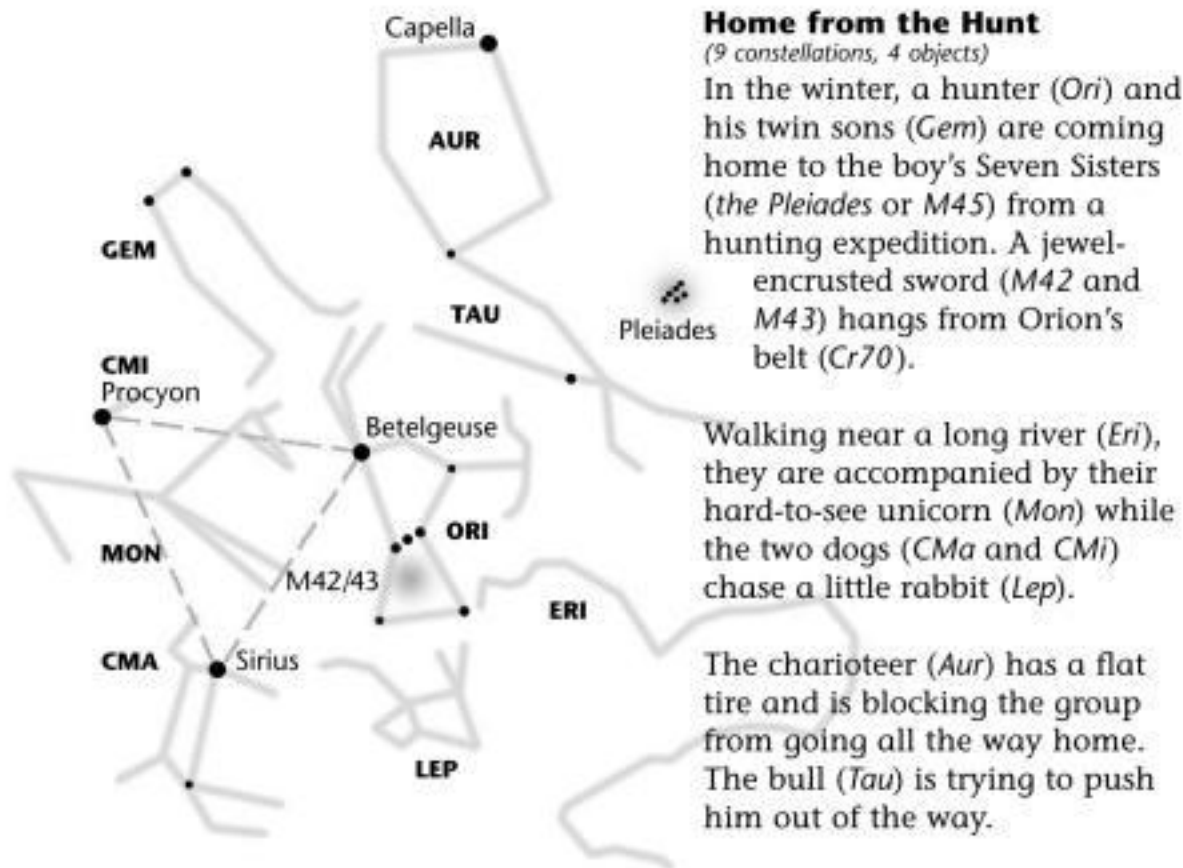


The Castle (6 constellations, 3 objects)

In the late fall, Perseus rides his camel (Cam) to ask Andromeda's parents, the King (Cep) and Queen (Cas), for their daughter's hand in marriage. He brings gifts of two jewels (the Double Cluster) for the Queen and a pair of earrings (M31 and M33) for the princess who is waiting with her winged horse (Peg).

Starhop to the earrings, M33 and M31:

Start at Alpheratz (1), go to the first pair in Andromeda (2) then to second pair (3). M31 is NE the same distance as pair #3 is apart. M33 is SW about twice pair #3's spacing.



Home from the Hunt (9 constellations, 4 objects)

In the winter, a hunter (Ori) and his twin sons (Gem) are coming home to the boy's Seven Sisters (the Pleiades or M45) from a hunting expedition. A jewel-encrusted sword (M42 and M43) hangs from Orion's belt (Cr70).

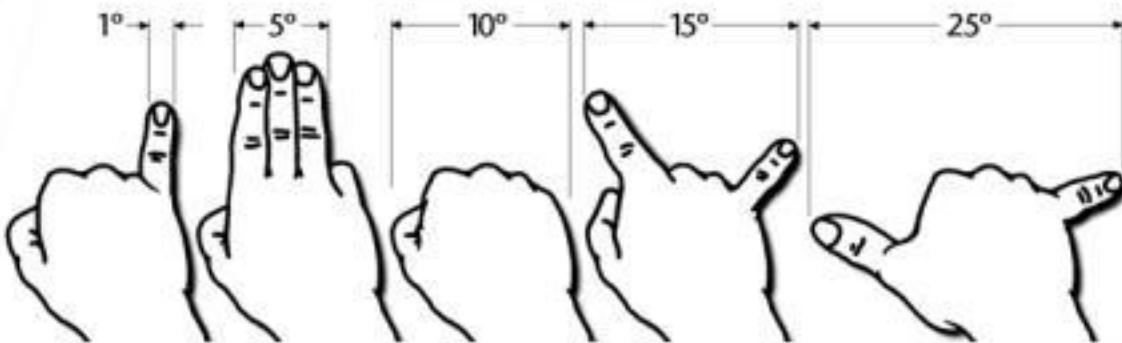
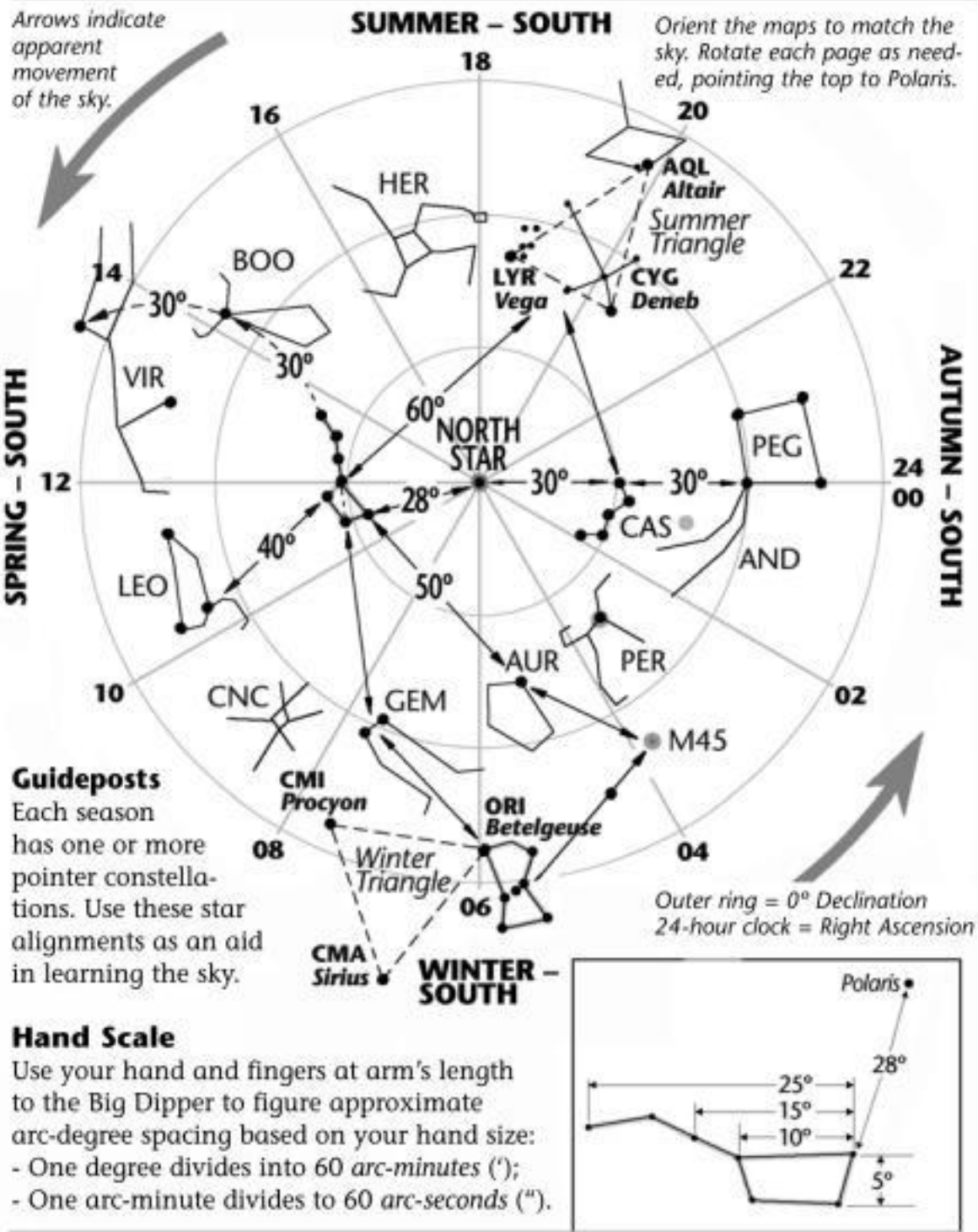
Walking near a long river (Eri), they are accompanied by their hard-to-see unicorn (Mon) while the two dogs (CMA and CMI) chase a little rabbit (Lep).

The charioteer (Aur) has a flat tire and is blocking the group from going all the way home. The bull (Tau) is trying to push him out of the way.

The Winter Triangle (3 constellations, 3 stars)

Sirius (α CMA), Procyon (α CMI) and Betelgeuse (α ORI) create the Winter Triangle. A larger asterism, the Hexagon, roughly circles Betelgeuse and connects Sirius, Rigel, Aldebaran, Capella, Castor and Pollux, and Procyon.

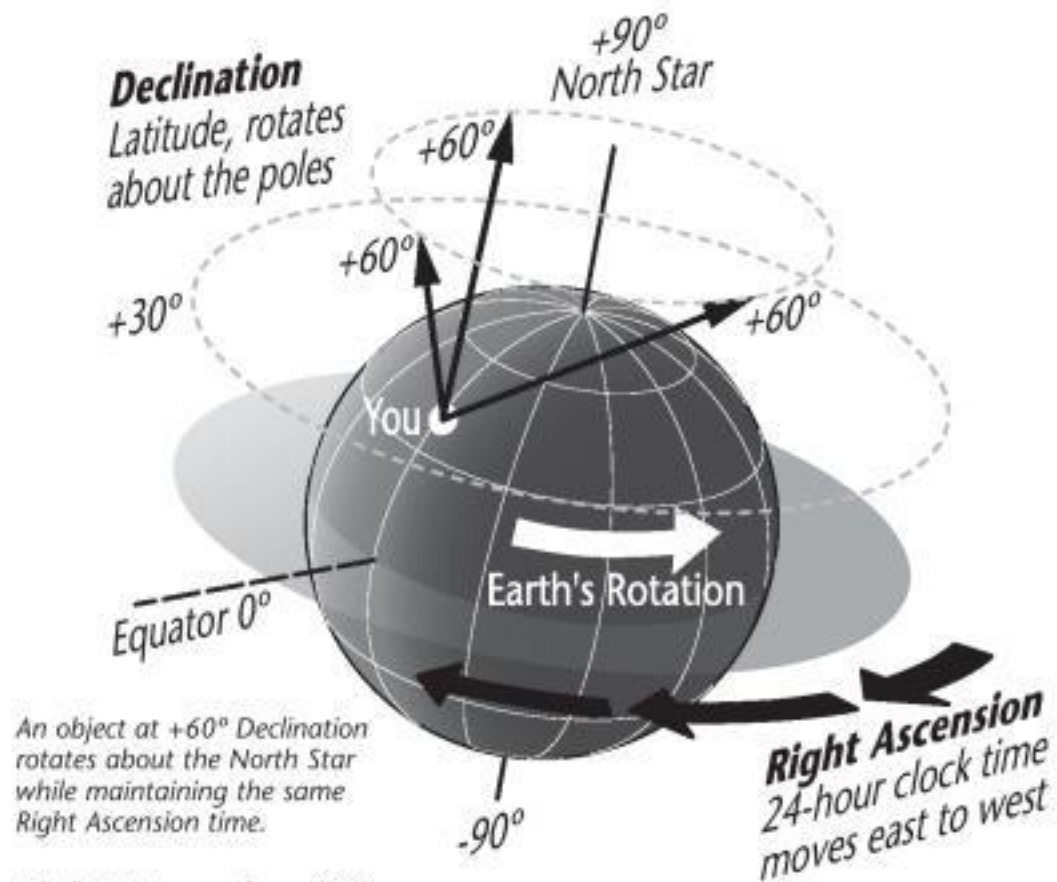
THE BIGGER PICTURE



12 Guideposts - Hand Scale

ADDRESSES IN THE SKY... WHERE IS IT?

Sky maps are divided into time and degree grid lines. These lines create a 2-part address for locating objects: *Right Ascension* (RA) is a 24-hour clock-type number, named so because while you are facing Polaris, the sky appears to rise (ascend) from the right. *Declination* (Dec) uses the Earth's projected latitude degrees. Together, the two numbers provide a location for sighting any given object in dimensional space.



Right Ascension (RA)

is an East-West address. It moves in relation to our view and is fixed on the constellations. Each RA time proceeds across the sky from east to west – like moving longitude lines – as the earth rotates underneath. The stars appear to move above your head from east to west but, in reality, they are stationary... you are on a planet that is rotating from west to east.

Declination (Dec)

divides the sky into North-South, Earth-oriented angles. They are non-changing and based on the latitude lines of the earth: $+90^\circ$ at the North Celestial Pole, 0° at the equator and -90° at the South Celestial Pole.

Altitude and Azimuth (AltAz)

make an orienting system used with dobsonian mounts and binoculars. Altitude is degrees from horizontal: 0° at the horizon; 90° directly overhead. Azimuth is points on a magnetic compass: 0° is north; 90° is east, 180° is south and 270° is west.

TELESCOPE TYPES

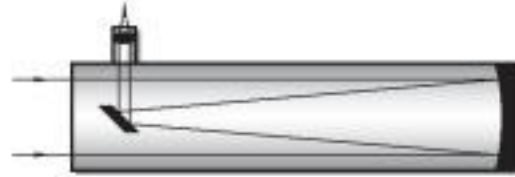
Refractor

Best for bright objects like planets and double stars. Quality optics provide exciting right-side-up views and can be costly.



Newtonian Reflector

Generally, the bigger the mirror, the fainter the object you can see due to increased contrast. From 2" to 36" in diameter.



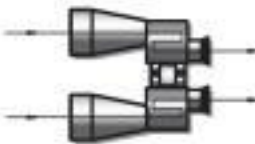
Cassegrain Reflector

This type "folds" reflected light to make a convenient size. Popular compromise between a pure reflector and refractor.



Binoculars

Best first piece of equipment. Great value with broad usability. Larger magnification requires tripod mounting.



MIRROR SIZE COMPARISON

All things being equal, bigger mirrors/lenses make better viewing.

An 8" reflector collects 4 times the light of a 4", and 2.6x that of a 5".

A 10" collects 6x the light of a 4", and 4x more than a 5".

Diameter	Light Gathering Area
4"	12.67in ² (8,171mm ²)
5"	19.63in ² (12,667mm ²)
6"	28.50in ² (18,385mm ²)
8"	50.66in ² (32,685mm ²)
10"	78.54in ² (50,671mm ²)

PRACTICAL LOWEST power magnification for any telescope is 7x for each inch of aperture. Example: 28x for a 4".

PRACTICAL HIGHEST power is 50x/inch of aperture. Ex: 200x for a 4".

MAGNIFICATION POWER = focal length (f/l) of the mirror divided by f/l of the eyepiece. Ex: 48" f/l (1200mm) / 10mm eyepiece = 120x

FIELD OF VIEW

A star at the **celestial equator** (Dec: 0°) moves from east to west at 15° per hour (**1° every 4 minutes**). Note the time it takes for an equatorial star to drift from one side of your eyepiece field of vision to the other. Divide the time it takes in minutes by 4 to get that eyepiece's *angular field of view* in degrees. Knowing this will be useful in judging separation of doubles and size of an object in view.

Example: If it takes six minutes for a star to drift across an eyepiece, the angular field of view is 1.5° (6÷4). This method works with any eyepiece, or combination as with a Barlow, on any type of telescope.

TRANSPARENCY SCALE

Transparency, seeing and sky darkness are ways of qualifying the conditions. The Saguaro Astronomy Club developed this scale where 0=worst, 10=best.

- 0** – Completely cloudy, no stars seen (why are you out?).
- 1** – 50% or more of the sky is cloudy.
- 2** – 25-50% of the sky is cloudy.
- 3** – 10-25% of the sky is cloudy.
- 4** – No clouds but hazy; only brightest stars seen down to 4th magnitude.
- 5** – Hazy, fainter stars to mag 5; Milky Way visible only in brighter regions.
- 6** – Milky Way visible only in brighter regions (SGR, CYG); stars to mag 5.8.
- 7** – Fainter stars to mag 6.0 seen; fainter parts of the Milky Way seen with averted vision; Zodiacal light seen with averted vision.
- 8** – Mag 6.0 stars are just seen; fainter parts of the Milky Way more obvious, Zodiacal light seen with direct vision.
- 9** – Stars fainter than mag 6.0 seen with direct vision as are faint portions of the Milky Way (LYR, LIB); gegenschein seen with averted vision.
- 10** – Profusion of stars; Zodiacal light and gegenschein form continuous band across the sky; Milky Way is very wide and bright throughout.

FILTERS FOR VISUAL OBSERVATION

Filters reduce glare, improve image definition and enhance contrast. 100+ colors and densities are available; a few basic ones like the #80A and Lunar are good starters. Can be hand-held, placed in slide mounts or threaded frames. Invest in quality filters, like quality eyepieces, for the best viewing.

Red – improves contrast on Mars, Jupiter and Saturn. Fairly dark, best on larger telescopes for brighter images. Alternate red and blue to bring out subtle colors on the Moon. (Kodak Wratten: #23A, 25, or 25A)

Orange – Martian detail; zonal detail on Jupiter; darkens the Earth's blue sky for daytime observations of Jupiter, Venus and the Moon. (#21)

Yellow – Detail in Venusian clouds; Martian dust storms. (#8, 12, or 15)

Green – Martian polar caps; Saturn and Jupiter details. (#58)

Blue – Dense clouds on Mars, spots in Jupiter's belt and zones of Saturn's clouds; reduces a bright Moon's glare. (#44A, #47B, #80A)

Violet – Saturn's ring structure; surface detail of Mercury & Venus. (#47)

Violet Reduction – Reduces chromatic aberration in achromatic refractors.

Lunar – Cuts glare and intensity so detail can be seen more clearly.

Polarizing – Cuts down glare when observing a bright Moon, makes it easier to see ray structure; cuts down day-time glare.

Light Pollution – Broad band; generally improves contrast in city skies.

Ultra-High Contrast – Narrow band for light polluted skies.

O-III – Extreme narrow band; for planetary and emission nebulae.

Hydrogen-Alpha – Observing solar detail; expensive.

Hydrogen-Beta – Nebulae; needed for Horsehead, Cocoon, California.

STAR LIGHT, STAR BRIGHT

Name	Constellation	Mag.	LY	Luminosity	Diameter; Mass; Other	Brightness Rank
☆☆ Aladfar	η LYR	5-6	1,041		@ 28" separation (sep); use low power	
☆☆ Alberio	β CYG	3.1/5	385	760	@ 35" sep; blue/gold, optical double	
Alcyone	η M45	2.9	370		Brightest in Pleiades	
☆☆ Aldebaran	α TAU	.86/13	65	360	D:45; red giant	13
☆☆ Alderamin	α CEP	2.5	52	23	will be North Star in ~5,000 yrs.	
☆☆ Algieba	γ LEO	2.2/3.4	126	90/30	Lion's Mane; @ 4" sep; yellow/green	
☆☆ Algiedi	α CAP	3.7/4.5	1,100/116		The Goat; optical ☆☆☆; "B" is also ☆☆☆	
Algol	β PER	2.2v	93	100	Demon Star; eclipsing variable	
☆☆ Almach	γ AND	2.3/5	355		☆☆☆ @10" sep; yellow/green-blue	
☆☆ Alnilam	ε ORI	1.7	1,300		Arrangement of Pearls	29
☆☆ α Centauri	α CEN	0.27	4.3		Rigel Kentaurus; ☆☆☆; yellow/orange	3
Altair	α AQL	0.77	16.8	9	The Flying Eagle; D:1.6; 6hr rotation	12
☆☆ Antares	α SCO	.92/4.5	600	12,000	D:500; red SG	15
Arcturus	α BOO	-0.04	34	139	Guardian of the Bear; D:27; M:4; orange	4
Barnard's ☆	OPH	9.5	5.97	.0004	D:0.17; M:0.16; 10.3/yr motion	
Bellatrix	γ ORI	1.6	245	4,000	Amazon Star; D:12; blue SG	25
☆☆ β Monoceros	MON	5/5/6	690	6	@ 7.4" sep; nice ☆☆☆	
Betelgeuse	α ORI	0.7v	1,000	15,000	The Armpit; D:550-900; red SG	11
Capella	α AUR	0.08	41	90	D:13; M:3; yellow; binary	6
☆☆ Castor	α GEM	1.6	45		6-sun system	23
☆☆ Cor Caroli	α CVN	3/5.5	110		Heart of Charles; @ 20" sep	
Deneb	α CYG	1.25	1,600	60,000	D:60; M:30; white SG	19
Denebola	β LEO	2.1	36	20	Point star to Realm of the Galaxies	
Erakis	μ CEP	v3.4-5	1,500	38,000	Herschel's Garnet Star; D:2,536; red SG	
ε Aurigae	ε AUR	3.0	3400		D:2,700; LARGEST Star	
☆☆ ε Lyrae	ε LYR	5-6	160		Double-Double; A-B @ 208" sep	
Fomalhaut	α PSA	1.3	25	14	Lone Star; D:2; in large darker area	18
☆☆ Izar	ε BOO	2.4	103		☆☆☆, difficult to separate	
Markab	α PEG	2.5	140	95	The Saddle; blue giant	
☆☆ Mesarthim	γ ARI	5th	148		The Fat Ram; @ 8" sep	
Mira	ο CET	3.0-9.5	220		D:500; M:0.5; long period variable	
☆☆ Mizar/Alcor	ζ UMA	2.4/4	88	35/15	@ 11.8" sep; ☆☆☆	
(El) Nath	β TAU	1.65	300	1,700	Opposite the Galactic Center	26
☆☆ v Draconis	v DRA	5	99		@ 62" sep; both pale yellow	
☆☆ ο' Cygni	ο' CYG	4/5/7	160-540		Patriotic Triple; ☆☆☆ in all eyepieces.	
☆☆ Polaris	α UMI	2.3v	430	4,500	The North Star; small companion	
Pollux	β GEM	1.15	36	35	D:11	17
Procyon	α CMI	0.35	11.4	6	D:2; @ 5" sep with very faint binary	8
Proxima Cen	CEN	0.36	4.3	13,000	D:0.05; CLOSEST to Earth	
☆☆ Ras Algethi	α HER	3.5v	380	1,000	D:470; @ 5" sep; red/green	
Regulus	α LEO	1.35	78	160	Little King; D:5; front paws	21
☆☆ Rigel	β ORI	0.1/6.7	770	50,000	D:30; @ 9" sep; blue-white SG	7
Sirius	α CMA	-1.45	8.6	23	Dog Star; D:1.8; BRIGHTEST	1
Shaula	λ SCO	1.6	700	1700	Tail of the Scorpion	24
Spica	α VIR	0.96v	260	1,300	Eclipsing variable; blue giant	16
☆☆ Tegmeni	ζ CNC	5	70	2	Fine ☆☆☆ @ 1" and 5" sep	
☆☆ Trapezium	ι ORI	5-8	1,325		Very young; close ☆☆☆ group	
Vega	α LYR	0.03	25	58	The Eagle; D:3; M:3; blue-white	5

Key:

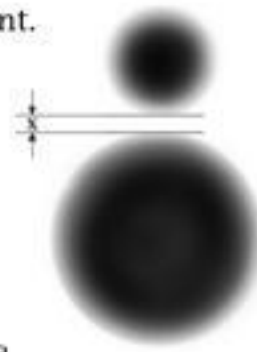
- D - diameter, Sun = 1
- M - mass, Sun = 1
- v - variable
- ☆☆ - Binocular double
- ☆☆☆ - Telescopic double
- ☆☆☆☆ - Triple/Multiple
- 9000 stars are visible to the naked eye

16 Major Stars

SEEING DOUBLE AND ENJOYING IT

Dividing a double star can test the limits of your instrument. This comparison is for best possible seeing conditions:

	Minimum visible separation (x)	Improvement over naked eye
Naked eye	6' (arc min.)	
Binoculars	9" (arc sec.)	40 times
4" reflector	2" (arc sec.)	180 times
6" reflector	0.8" (arc sec.)	450 times



T.W.Webb (and many others) spoke about the effects of the atmosphere on seeing and splitting doubles: "The range of visibility is limited not only by the light of the instrument and the sensitiveness of the eye, but to an extent that could not have been anticipated, by the conditions of the air."

R. Burnham remarked, "... an object-glass of 6 inches one night will show the companion to Sirius perfectly, on the next night, just as good in every aspect so far as one can tell with the unaided eye, the largest telescope in the world will show no more trace of the small star than if it had been blotted out of existence."

DOUBLE STARS LIST

AND γ **	CAP α **	ERI θ ☆☆	OPH o **	SCO α ☆☆
AQR ζ **	β **	32 **	ρ ☆☆	β **
41 ☆☆	CAS η **	40 ☆☆	36 **	λ/υ ☆☆
94 **	ι ☆☆	55 **	70 **	ν **
AQL α ☆☆	σ **	GEM α **	Bull ☆☆	ξ **
π ☆☆	CEN α ☆☆	δ **	ORI β **	Σ1999 **
57 **	CEP β **	38 ☆☆	δ **	SCL κ ☆☆
Σ2404 **	δ **	HER α **	ζ **	SCT Σ2306 ☆☆
ARI γ **	μ ☆☆	δ **	ι **	SER δ **
λ **	ξ **	κ **	λ **	θ **
1 ☆☆	Σ2816 **	ρ **	σ **	SEX 35 ☆☆
Σ326 ☆☆	CET γ **	95 **	θ1 **	TAU α ☆☆
AUR α ☆☆	COL α ☆☆	HYA ε ☆☆	θ2 **	τ ☆☆
ε ☆☆	COM 24 **	N **	Σ747 **	φ ☆☆
θ **	CRB ζ **	54 ☆☆	PEG ε **	χ **
14 ☆☆	σ **	LAC 8 **	PER ε ☆☆	118 **
BOO δ **	CRV δ **	LEO α **	η **	Σ340 ☆☆
ι **	CRT Σ1530 ☆☆	β ☆☆	Σ331 **	Σ548 ☆☆
ε **	CYG β **	γ **	PSC α **	TRI ι **
κ **	31 **	54 **	ζ **	UMA ζ **
μ **	61 **	LEP γ **	ψ1 **	ξ ☆☆
ξ **	DEL α ☆☆	H3752 ☆☆	55 ☆☆	65 ☆☆
π **	γ **	LIB α **	65 **	UMI α **
CAM 1 **	DRA β ☆☆	LYN 12 **	PUP κ **	π1 ☆☆
24 ☆☆	μ **	19 **	ξ ☆☆	VIR γ ***
32 **	ν **	38 **	θ ☆☆	θ ☆☆
Σ485 ☆☆	ψ **	LYR β **	SGE ζ ☆☆	τ ☆☆
CNC ζ **	16/17 **	ε **	SGR μ ☆☆	
ι **	40/41 **	ζ **	π ☆☆	
24 ☆☆	EQU ε ☆☆	Σ525 **	54 ☆☆	
CVN α **		MON β **		
CMA ε **		ε **		
H3945 ☆☆				

Key:
 ** "Special" 100
 ☆☆ Others listed
 * γ Vir too close for 6" to separate

DEEP-SKY OBJECT TYPES

Deep-sky objects are loosely defined as objects outside our solar system that consist of more than a single star system or involve nebulosity.

GALAXIES – seen in many types and shapes. They are classed as Spiral, Elliptical and Irregular:

- *Spiral Galaxy* – like our own Milky Way and the famous Andromeda Galaxy, our closest galactic neighbor.
- *Elliptical galaxies* – show no spiral or structure; not known to rotate.
- *Irregular galaxies* – coarse; lacking symmetry and may be gravitationally distorted.

GALAXY DESIGNATIONS:

- S** – Spiral, arms curve outward from rounded center.
SB – Barred Spiral, defined arms from sides of a flattened center.
S0 – Disk with no spiral arms.
- Spiral-class suffixes:**
- a** – Dominant center, tight arms.
b – Equal center and arms.
c – Small center, wide arms.
d – Tiny center, coarse arms.
- Other types of galaxies:**
- E** – Elliptical.
 EQ (round) to EZ (lens-shaped).
I – Irregular: "IG"/"Irr" in charts.
p – Peculiar; suffix to all above.

OPEN CLUSTERS (OC) – groups of stars held together by mutual gravitational attraction; part of our Milky Way and found in the Galactic Plane; relatively young, cosmologically speaking, only hundreds of millions of years old.

GLOBULAR CLUSTERS (GC) – groupings of 10,000 to one million stars bound together gravitationally,

they populate the bulge of galaxies with significant groupings nearer the centers. Spectroscopic studies show these stars contain fewer heavy elements than in Sun-like stars, those formed in the disks of galaxies; heavy elements are essential for the formation of life. GC's are very old and formed from an earlier generation of stars; age estimates are about ten billion years, not much younger than the universe itself. They may also be cores of small galaxies cannibalized by the Milky Way.

NEBULA – three main types of nebulae, Dark, Emission and Reflective.

- *Dark Nebula* – blocks light from behind it; not illuminated by embedded or nearby stars; none in original Messier catalog; some are famous like the Horsehead Nebula in Orion.
- *Emission Nebulae* (appears red in visible light photographs) – close enough to star(s) to be stimulated into glowing. See: M42-Ori.
- *Reflective Nebulae* (appears blue) – too far away from the star(s) to glow; only reflect light. See: M45-Tau.
- *Planetary Nebulae* – emission-type, created when a star uses up its nuclear fuel then throws off a large portion of its mass as gas. The dim white dwarf that's left excites the gas showing the nebulosity. See: M57-Lyr.
- *Supernova Remnant* – from a most violent star explosion (Type II Supernova); flashes with a luminosity of up to ten billion times the Sun. The star's mass was ejected as a rapidly expanding gas shell. See: M1-Tau.

Other objects for study include stars, planets, asteroids, comets, meteors, cosmology, spectroscopy, light, telescope making, lens making, coatings and more. The sky truly is the limit.

18 Object Types

MESSIER INDEX

No.	Const.	Type	No.	Const.	Type	Messier Marathon by Constellation			
						Constellation	No of objects		
○	M1	TAU	SNR	○	M56	LYR	GC	<input type="checkbox"/> PSC – Sunset	1
○	M2	AQR	GC	○	M57	LYR	PN	<input type="checkbox"/> CET	1
○○	M3	CVN	GC	○	M58*	VIR	SG	<input type="checkbox"/> TRI	1
○○	M4	SCO	GC	○	M59	VIR	EG	<input type="checkbox"/> AND	3
○○	M5	SER	GC	○	M60	VIR	EG	<input type="checkbox"/> CAS	2
○○	M6	SCO	OC	○	M61*	VIR	SG	<input type="checkbox"/> PER	2
○○	M7	SCO	OC	○	M62	OPH	GC	<input type="checkbox"/> TAU	2
○○	M8	SGR	EN	○	M63	CVN	SG	<input type="checkbox"/> LEP	1
○	M9	OPH	GC	○○	M64	COM	SG	<input type="checkbox"/> ORI	3
○○	M10	OPH	GC	○	M65	LEO	SG	<input type="checkbox"/> GEM	1
○	M11	SCT	OC	○	M66*	LEO	SG	<input type="checkbox"/> AUR	3
○	M12	OPH	GC	○○	M67	CNC	OC	<input type="checkbox"/> CMA	1
○○	M13	HER	GC	○	M68	HYA	GC	<input type="checkbox"/> PUP	3
○	M14	OPH	GC	○	M69	SGR	GC	<input type="checkbox"/> MON	1
○○	M15	PEG	GC	○	M70	SGR	GC	<input type="checkbox"/> HYA M48	1
○○	M16	SER	EN	○	M71	SGE	GC	<input type="checkbox"/> CNC	2
○○	M17	SGR	EN	○	M72	AQR	GC	<input type="checkbox"/> LEO	5
○	M18	SGR	OC	○	M73	AQR	Ast	<input type="checkbox"/> UMA	7
○	M19	OPH	GC	○	M74	PSC	SG	<input type="checkbox"/> CVN	5
○○	M20	SGR	ER	○	M75	SGR	GC	<input type="checkbox"/> COM	8
○	M21	SGR	OC	○	M76	PER	PN	<input type="checkbox"/> VIR	11
○○	M22	SGR	GC	○	M77	CET	SG	<input type="checkbox"/> HYA M68/83	2
○○	M23	SGR	OC	○	M78	ORI	RN	<input type="checkbox"/> SER M5	1
○○	M24	SGR	OC	○	M79	LEP	GC	<input type="checkbox"/> HER	2
○○	M25	SGR	OC	○	M80	SCO	GC	<input type="checkbox"/> LYR	2
○	M26	SCT	OC	○○	M81	UMA	SG	<input type="checkbox"/> CYG	2
○○	M27	VUL	PN	○○	M82	UMA	IG	<input type="checkbox"/> VUL	1
○	M28	SGR	GC	○	M83*	HYA	SG	<input type="checkbox"/> SGE	1
○○	M29	CYG	OC	○	M84*	VIR	EG	<input type="checkbox"/> OPH	7
○	M30	CAP	GC	○	M85	COM	SG	<input type="checkbox"/> SCO	4
○○	M31	AND	SG	○	M86	VIR	EG	<input type="checkbox"/> SCT	2
○	M32	AND	EG	○	M87	VIR	EG	<input type="checkbox"/> SER M16	1
○○	M33	TRI	SG	○	M88	COM	SG	<input type="checkbox"/> SGR	15
○○	M34	PER	OC	○	M89	VIR	EG	<input type="checkbox"/> PEG	1
○○	M35	GEM	OC	○	M90	VIR	SG	<input type="checkbox"/> AQR	3
○○	M36	AUR	OC	○	M91	COM	SG	<input type="checkbox"/> CAP – Sunrise	2
○○	M37	AUR	OC	○○	M92	HER	GC		
○○	M38	AUR	OC	○	M93	PUP	OC		
○○	M39	CYG	OC	○	M94	CVN	SG		
○	M40	UMA	Ast	○	M95	LEO	SG		
○○	M41	CMA	OC	○	M96	LEO	SG		
○○	M42	ORI	ER	○	M97	UMA	PN		
○○	M43	ORI	ER	○	M98	COM	SG		
○○	M44	CNC	OC	○	M99*	COM	SG		
○○	M45	TAU	C/N	○	M100*	COM	SG		
○○	M46	PUP	OC	○	M101*	UMA	SG		
○○	M47	PUP	OC	○	M102	DRA	EG		
○○	M48	HYA	OC	○	M103	CAS	OC		
○	M49	VIR	EG	○	M104	VIR	SG		
○○	M50	MON	OC	○	M105	LEO	EG		
○	M51	CVN	SG	○	M106	CVN	SG		
○	M52	CAS	OC	○	M107	OPH	GC		
○○	M53	COM	GC	○	M108	UMA	SG		
○	M54	SGR	GC	○	M109	UMA	SG		
○	M55	SGR	GC	○	M110	AND	EG		

Mid-March's new moon is usually the best time for a Messier Marathon. The goal is to find them all in a single night.

Key:
 ○ – telescopic
 ○○ – binocular
 * – galaxies with 2 or more supernovae
Bold – to mag 7

NEW GENERAL CATALOG (NGC) INDEX

00:00 (RA) Fall			04:00 Winter			06:00 Winter		
○ NGC40	CEP	PN	○ 1365*	FOR	SG	○ 1788	ORI	EN
○○ 55	SCL	EG	○ 1380	FOR	SG	○ 1792	COL	SG
○ 103	CAS	OC	○ 1395	ERI	EG	○○ 1807	TAU	OC
○○ 129	CAS	OC	○ 1398	FOR	SG	○ 1808	COL	SG
○ 133	CAS	OC	○ 1399	FOR	SG	○○ 1817	TAU	OC
○ 146	CAS	OC	○ 1407	ERI	EG	○ 1851	COL	GC
○ 147	CAS	OC	○ 1419	PER	EN	○ 1857	AUR	OC
○ 157	CET	SG	○ 1432	TAU	RN	○○ 1893	AUR	OC
○ 185	CAS	EG	○ 1435	TAU	RN	○ 1904 M79	LEP	GC
○ 188	CEP	OC	○ 1444	PER	OC	○○ 1907	AUR	OC
○ 189	CAS	OC	04:00 Winter			○○ 1912 M38	AUR	OC
○ 205 M110	AND	EG	○ 1491	PER	EN	○ 1931	AUR	EN
○ 206	AND	OC	○ 1496	PER	OC	○ 1952 M1	TAU	SNR
○ 221 M32	AND	EG	○ 1499	PER	EN	○○ 1960 M36	AUR	OC
○○ 224 M31	AND	SG	○○ 1502	CAM	OC	○○ 1976 M42	ORI	ER
○ 225	CAS	OC	○ 1513	PER	OC	○ 1977	ORI	C/N
○ 246	CET	PN	○ 1514	TAU	PN	○ 1980	ORI	C/N
○ 247	CET	SG	○○ 1528	PER	OC	○○ 1981	ORI	OC
○○ 253	SCL	EG	○ 1532	ERI	SG	○○ 1982 M43	ORI	ER
○ 272	AND	OC	○ 1535	ERI	PN	○ 1990	ORI	EN
○ 281	CAS	C/N	○ 1545	PER	OC	○ 1999	ORI	BN
○ 288	SCL	GC	○○ 1582	PER	OC	○ 2017	LEP	OC
○ 300	SCL	SG	○○ 1647	TAU	OC	○ 2024	ORI	EN
01:00 Fall			○○ 1662	ORI	OC	○ 2068 M78	ORI	RN
○ 381	CAS	OC	○ 1664	AUR	OC	○○ 2099 M37	AUR	OC
○ 436	CAS	OC	05:00 Winter			○ 2112	ORI	OC
○ 404	AND	SG	○ 1724	AUR	OC	06:00 Winter		
○○ 457	CAS	OC	○○ 1746	TAU	OC	○ 2126	AUR	OC
○ 488	PSC	SG	○ 1778	AUR	OC	○ 2129	GEM	OC
○ 559	CAS	OC	Catalog or Observatory Names (Object type)			○ 2141	ORI	OC
○ 581 M103	CAS	OC	Ant	- Antalova; Russian (OC)				
○○ 598 M33	TRI	SG	Basel	- Univ. of Basel, Switzerland (OC)				
○ 613	SCL	EG	Berk	- Univ. of California at Berkeley (OC)				
○ 628 M74	PSC	SG	Biur	- Biurakan Observatory (OC)				
○ 637	CAS	OC	Bla	- Victor Blanco Observatory, Chile (OC)				
○ 650 M76	PER	PN	Boc	- Bochum; Ruhr-University, Germany (OC)				
○ 654	CAS	OC	Cr, Col	- Per Collinder, 1931 (OC)				
○ 659	CAS	OC	Cz	- M. Czernik (OC)				
○○ 663	CAS	OC	Do/DoDz	- Dolidze/Dzimselejsvili (OC)				
○ 689	DEL	OC	Frolov	- (OC)				
○ 743	CAS	OC	Haf	- Haffner; German Observatory (OC)				
○ 744	PER	OC	Har	- Harvard Univ. (OC)				
○○ 752	AND	OC	IC	- Index Catalog, addition to NGC 1888-1894				
○ 772	ARI	SG	King	- I. King, Harvard Univ. (OC)				
02:00 Fall			LG	- Le Gentil (contemporary of Messier)				
○○ 869	PER	OC	M	- Charles Messier, mid-1700's				
○○ 884	PER	OC	Mrk	- B.E.Markarian et al, 1989 (OC and galaxies)				
○ 891	AND	SG	MCG	- Morphological Catalog of Galaxies, Moscow				
○ 925	TRI	EG	Mel	- P. J. Melotte, 1915 (OC)				
○ 936	CET	SG	NGC	- New General Cat. of Nebulae & Clusters, 1888				
○ 956	AND	OC	Pal	- Palomar Observatory, 1955 (GC)				
○○ 957	PER	OC	Pismis	- Paris Pismis, 1979 (GC)				
○ 1023	PER	SG	PK	- Perek & Kohoutek, Prague, 1967 (PN, GC)				
○ 1027	CAS	OC	Ros	- Curt Roslund, Hungary, 1960 (OC)				
○○ 1039 M34	PER	OC	Ru	- J. Ruprecht (OC)				
○ 1068 M77	CET	SG	Steph	- Stephenson (OC)				
○ 1097*	FOR	SG	Stk	- Jurgen Stock (OC)				
03:00 Winter			Tom	- Clyde Tombaugh, 1938-1941 (OC)				
○ 1232	ERI	SG	Tr	- R.J.Trumpler, 1930 (OC)				
○ 1245	PER	OC	UGC	- Uppsala General Catalog, 1973 (Galaxies)				
○ 1291	ERI	GC	vdB	- Sidney van den Bergh-Waterloo (OC, Nebulae)				
○ 1316*	FOR	GC						
○○ 1342	PER	OC						
○ 1360	FOR	PN						

NGC INDEX

○	2158	GEM	OC
○	2168	M35	GEM OC
○	2169	ORI	OC
○	2175	ORI	EN
○	2175S	ORI	OC
○	2186	ORI	OC
○	2194	ORI	OC
○	2204	CMA	OC
○	2215	MON	OC
○	2232	MON	OC
○	2236	MON	OC
○	2237	MON	C/N
○	2243	CMA	OC
○	2244	MON	OC
○	2247	MON	RN
○	2250	MON	OC
○	2251	MON	OC
○	2252	MON	OC
○	2254	MON	OC
○	2261	MON	ER
○	2264	MON	OC
○	2266	GEM	OC
○	2269	MON	OC
○	2281	AUR	OC
○	2286	MON	OC
○	2287	M41	CMA OC
○	2298	PUP	OC
○	2301	MON	OC
○	2302	MON	OC
○	2304	GEM	OC
○	2311	MON	OC

07:00 Winter

○	2323	M50	MON OC
○	2324	MON	OC
○	2331	GEM	OC
○	2335	MON	OC
○	2343	MON	OC
○	2345	CMA	OC
○	2353	MON	OC
○	2354	CMA	OC
○	2355	GEM	OC
○	2356	GEM	OC
○	2359	CMA	EN
○	2360	CMA	OC
○	2362	CMA	OC
○	2367	CMA	OC
○	2372	GEM	PN
○	2374	CMA	OC
○	2383	CMA	OC
○	2384	CMA	OC
○	2392	GEM	PN
○	2395	GEM	OC
○	2396	PUP	OC
○	2403	CAM	SG
○	2409	PUP	OC
○	2414	PUP	OC
○	2420	GEM	OC
○	2421	PUP	OC
○	2422	M47	PUP OC
○	2423	PUP	OC
○	2437	M46	PUP OC
○	2438	PUP	PN
○	2439	PUP	OC
○	2440	PUP	PN
○	2447	M93	PUP OC
○	2451	PUP	OC
○	2453	PUP	OC

○	2467	PUP	OC
○	2477	PUP	OC
○	2479	PUP	OC
○	2482	PUP	OC
○	2483	PUP	OC
○	2489	PUP	OC

08:00 Winter

○	2506	MON	GC
○	2509	PUP	OC
○	2527	PUP	OC
○	2533	PUP	OC
○	2539	PUP	OC
○	2546	PUP	OC
○	2548	M48	HYA OC
○	2567	PUP	OC
○	2568	PUP	OC
○	2571	PUP	OC
○	2579	PUP	EN
○	2580	PUP	OC
○	2587	PUP	OC
○	2627	PYX	OC
○	2632	M44	CNC OC
○	2655	CAM	SG
○	2658	PYX	OC
○	2681	UMA	SG
○	2682	M67	CNC OC
○	2683	LYN	SG

09:00 Spring

○	2768	UMA	EG
○	2818	PYX	OC
○	2841*	UMA	SG
○	2903	LEO	SG
○	2905	LEO	GC
○	2976	UMA	IG
○	2997	ANT	GC
○	3031	M81	UMA SG
○	3034	M82	UMA IG

10:00 Spring

○	3077	UMA	IG
○	3109	HYA	PN
○	3115	SEX	GC
○	3132	VEL	PN
○	3184*	UMA	SG
○	3242	HYA	PN
○	3310	UMA	SG
○	3344	LMI	SG
○	3351	M95	LEO SG
○	3368	M96	LEO SG
○	3379	M105	LEO EG
○	3384	LEO	EG
○	3412	LEO	EG

11:00 Spring

○	3521	LEO	GC
○	3556	M108	UMA SG
○	3585	HYA	EG
○	3587	M97	UMA PN
○	3607	LEO	EG
○	3621	HYA	SG
○	3623	M65	LEO SG
○	3627*	M66	LEO SG
○	3628	LEO	SG
○	3680	CEN	PN
○	3923	HYA	SG
○	3941	UMA	SG
○	3953	UMA	SG
○	3992	M109	UMA SG

12:00 Spring

○	4038	CRV	PN
○	4111	CVN	SG
○	4125	DRA	SG
○	4147	CAM	GC
○	4192	M98	COM SG
○	4214	CVN	SG
○	4216	VIR	SG
○	4236	DRA	SG
○	4244	CVN	SG
○	4248	M106	CVN SG
○	4251	COM	SG
○	4254*	M99	COM SG
○	4274	COM	SG
○	4278	COM	EG
○	4303*	M61	VIR SG
○	4321*	M100	COM SG
○	4361	CRV	PN
○	4374*	M84	VIR EG
○	4382	M85	COM SG
○	4406	M86	VIR EG
○	4414	COM	SG
○	4429	VIR	SG
○	4438	VIR	SG
○	4449	CVN	IG
○	4450	COM	SG
○	4472	M49	VIR EG
○	4486	M87	VIR EG
○	4490	CVN	SG
○	4494	COM	SG
○	4501	M88	COM SG
○	4517	VIR	EG
○	4526*	VIR	EG
○	4535	VIR	SG
○	4548	M91	COM SG
○	4552	M89	VIR EG
○	4559	COM	SG
○	4594	M104	VIR SG
○	4565/7	CVN	SG
○	4569	M90	VIR EG
○	4579*	M58	VIR SG
○	4590	M68	VIR EG
○	4605	UMA	SG
○	4621	M59	HYA GC
○	4631	CVN	SG
○	4636	VIR	EG
○	4649	M60	VIR EG
○	4697	VIR	EG
○	4699*	VIR	SG
○	4725*	COM	SG
○	4736	M94	CVN SG
○	4753*	VIR	EG
○	4762	VIR	SG
○	4826	M64	COM SG

Key:

- - telescopic
- ○ - binocular
- * - galaxies with 2 or more supernovae
- Bold** - to mag Z

NGC INDEX

13:00 Spring			○ 6369	OPH	PN	○ 6720	M57	LYR	PN
○ 5005		CVN	SG	○ 6396	SCO	OC	○ 6723	SGR	GC
○ 5024	M53	COM	GC	○ 6400	SCO	OC	○ 6724	AQL	OC
○ 5033		CVN	SG	○ 6401	OPH	GC	19:00 Summer		
○ 5053		COM	GC	○ 6402	M14	OPH	○ 6738	AQL	OC
○ 5055	M63	CVN	SG	○ 6405	M6	SCO	○ 6755	AQL	OC
○ 5068		VIR	SG	○ 6416		SCO	○ 6760	AQL	GC
○ 5102		CEN	SG	○ 6425		SCO	○ 6779	M56	LYR
○ 5128		CEN	IG	○ 6440		SGR	○ 6791		LYR
○ 5139		CEN	GC	○ 6441		SCO	○ 6802		VUL
○ 5194	M51	CVN	SG	○ 6451		SCO	○ 6809	M55	SGR
○ 5195		CVN	IG	○ 6453		SCO	○ 6811		CYG
○ 5236*	M83	HYA	SG	○ 6469		SGR	○ 6818		SGR
○ 5247		VIR	SG	○ 6475	M7	SCO	○ 6819		CYG
○ 5272	M3	CVN	GC	○ 6494	M23	SGR	○ 6822		SGR
○ 5322		UMA	EG	○ 6496		SCO	○ 6823		VUL
○ 5363		VIR	EG	○ 6503		DRA	○ 6826		CYG
14:00 Spring			○ 6507		SGR	OC	○ 6830		VUL
○ 5457*	M101	UMA	SG	18:00 Summer			○ 6834		CYG
○ 5466		BOO	GC	○ 6514	M20	SGR	○ 6838	M71	SGE
○ 5634		VIR	GC	○ 6520		SGR	○ 6853	M27	VUL
○ 5746		VIR	SG	○ 6522		SGR	20:00 Summer		
15:00 Summer			○ 6523	M8	SGR	EN	○ 6864	M75	SGR
○ 5824		LUP	GC	○ 6528		SGR	○ 6866		CYG
○ 5846		VIR	EG	○ 6530		SGR	○ 6871		CYG
○ 5866	M102	DRA	EG	○ 6531	M21	SGR	○ 6874		CYG
○ 5897		LIB	GC	○ 6539		SER	○ 6882		VUL
○ 5904	M5	SER	GC	○ 6541		CRA	○ 6883		CYG
○ 5986		LUP	GC	○ 6543		DRA	○ 6885		VUL
16:00 Summer			○ 6544		SGR	GC	○ 6910		CYG
○ 6093	M80	SCO	GC	○ 6546		SGR	○ 6913	M29	CYG
○ 6121	M4	SCO	GC	○ 6553		SGR	○ 6934		DEL
○ 6124		SCO	OC	○ 6558		SGR	○ 6939		CEP
○ 6139		SCO	OC	○ 6568		SGR	○ 6940		VUL
○ 6144		SCO	OC	○ 6569		SGR	○ 6946*		CYG
○ 6171	M107	OPH	GC	○ 6572		OPH	○ 6960		CYG
○ 6205	M13	HER	GC	○ 6583		SGR	○ 6981	M72	AQR
○ 6210		HER	PN	○ 6590		SGR	○ 6994	M73	AQR
○ 6218	M12	OPH	GC	○ 6595		SGR	○ 6996		CYG
○ 6229		HER	GC	○ 6604		SER	○ 6997		CYG
○ 6231		SCO	OC	○ 6605		SER	21:00 Fall		
○ 6235		OPH	SG	○ 6611	M16	SER	○ 7000		CYG
○ 6242		SCO	OC	○ 6613	M18	SGR	○ 7008		CYG
○ 6254	M10	OPH	GC	○ 6618	M17	SGR	○ 7009		AQR
○ 6266	M62	OPH	GC	○ 6624		SGR	○ 7023		CEP
17:00 Summer			○ 6625		SCT	OC	○ 7027		CYG
○ 6268		SCO	OC	○ 6626	M28	SGR	○ 7031		CYG
○ 6273	M19	OPH	GC	○ 6633		OPH	○ 7039		CYG
○ 6281		SCO	OC	○ 6637	M69	SGR	○ 7062		CYG
○ 6284		OPH	GC	○ 6638		SGR	○ 7063		CYG
○ 6287		OPH	GC	○ 6642		SGR	○ 7067		CYG
○ 6293		OPH	GC	○ 6645		SGR	○ 7071		CYG
○ 6302		SCO	PN	○ 6647		SGR	○ 7078	M15	PEG
○ 6304		OPH	GC	○ 6649		SCT	○ 7082		CYG
○ 6316		OPH	GC	○ 6652		SGR	○ 7086		CYG
○ 6322		SCO	OC	○ 6656	M22	SGR	○ 7089	M2	AQR
○ 6333	M9	OPH	GC	○ 6664		SCT	○ 7092	M39	CYG
○ 6341	M92	HER	GC	○ 6681	M70	SGR	○ 7099	M30	CAP
○ 6342		OPH	SG	○ 6683		SCT	○ 7128		CYG
○ 6355		OPH	GC	○ 6694	M26	SCT	○ 7142		CEP
○ 6356		OPH	GC	○ 6704		SCT	○ 7160		CEP
○ 6366		OPH	OC	○ 6705	M11	SCT	22:00 Fall		
○ 6374		SCO	OC	○ 6709		AQL	○ 7209		LAC
○ 6383		SCO	OC	○ 6712		SCT	○ 7217		PEG
○ 6388		SCO	GC	○ 6715	M54	SGR	○ 7226		CEP
				○ 6716		SGR			
				○ 6717		SGR			

COMMON NAMES

STARS			OBJECTS		
Name	Object #	Const.	Name	Object #	Const.
☆☆ Amazon Star	Bellatrix	ORI	○○ Airplane/Owl Cluster	NGC457	CAS
☆ The Armpit	Betelgeuse	ORI	○ Airplane Asterism	STAR-12	CAS
☆ Arrangement of Pearls	Alnilam	ORI	○○ Andromeda Galaxy	M31	AND
☆ Barnard's Star	Munich15040	OPH	○ Antenna	NGC4038/39	CRV
☆☆ Bull of Poniatowsky, NE of	Mel186	OPH	○ Apple Core Nebula	M27	VUL
☆ Demon Star	Algol	PER	○○ The Archangel	Ast	CAS
☆ Dog Star	Sirius	CMA	○ Backwards 5 Asterism	STAR-23	HER
☆☆ Double-Double	ε	LYR	○ Barnard's Galaxy	NGC6822	SGR
☆☆ Dragon's Eyes	β+v	DRA	○○ Beehive Cluster/Praesepe	M44	CNC
☆ The Eagle	Vega	LYR	○ Berenice's Hairclip/Needle	4565	COM
☆☆ Fat Ram	Mesarthim	ARI	○ Black Eye Galaxy	M64	COM
☆☆ Flying Eagle	Altair	AQL	○ Blinking Planetary	NGC6826	CYG
☆☆ The Goat	Algiedi	CAP	○ Blue Racketball Neb	NGC6572	OPH
☆ Guardian of the Bear	Arcturus	BOO	○ Blue Snowball	NGC7662	AND
☆ Heart of Charles	Cor Caroli	CVN	○○ Bode's Nebula/Galaxy	M81	UMA
☆ Herschel's Garnet Star	μ	CEP	○ Bow Tie Nebula	NGC40	CEP
☆ Hind's Crimson Star	R	LEP	○ Broken Engagement Ring	STAR-19	UMA
☆☆ The Horseman	Castor	GEM	○ Bubble Nebula	NGC7635	CAS
☆ LaSuperba	γ	CVN	○ Bug Nebula	NGC6302	SCO
☆☆ Lion's Mane	Algieba	LEO	○○ Butterfly Cluster	M6	SCO
☆ Little Dog	Procyon	CMI	○ California Nebula	NGC1499	PER
☆ Little King/Heart of Lion	Regulus	LEO	○ Cat's Eye Nebula	NGC6543	DRA
☆ Lone Star	Fomalhaut	PSA	○○ Christmas Tree	NGC2264	MON
☆☆ Patriotic Triple	ο ¹	CYG	○○ Cigar Nebula/Galaxy	M82	UMA
☆ Queen Who Wards off Evil Storms	Alnilam	ORI	○ Cleopatra's Eye Neb	NGC1535	ERI
☆ The Saddle	Markab	PEG	○ Coal Sack	α, β, λ	CYG
☆ The She-Goat	Capella	AUR	○○ Coathanger	Cr399	VUL
☆ Swan's Breast	Sadr	CYG	○ Cocoon Nebula	IC5146	CYG
☆ Wonderful Star	Mira	CET	○○ Coma Star Cluster	Mel111	COM
			○ Cooling Tower Cluster	M29	CYG
			○ Cone Nebula	NGC2264	MON
			○ Crab Nebula	M1	TAU
			○ Crescent Nebula	NGC6445	SGR
			○ Delle Caustiche	M24	SGR
			○○ deMairan's Nebula	M43	ORI
			○ Diamond Ring	STAR-1	UMI
			○ Dolphin's Diamonds	STAR-27	DEL
			○○ Double Cluster	NGC869/884	PER
			○ Duck Neb/Thor's Helmet	2359	CMA
			○ Dumbbell Nebula	M27	VUL
			○○ Eagle Nebula	M16	SER
			○ Eight-Burst Planetary	NGC3132	VEL
			○ The Elephant Trunk	IC1369	CEP
			○ The Embryo Nebula	IC1848	CAS
			○ Eskimo/Clown Face Neb	NGC2392	GEM
			○ The Eyes	NGC4438	VIR
			○ Flaming Star Nebula	IC405	AUR
			○ Fireworks Galaxy	NGC6946	CEP

ALBERIO TYPES (blue/gold doubles):

☆☆ 24Com	COM	Spring
☆☆ Alberio	β	CYG Summer
☆☆ Miram, reverse Alberio	η	PER Fall
☆☆ H3945	CMA	Winter

Names are usually assigned either by the constellation in which the object is situated, to honor the discoverer, or to describe an object's appearance in a way that is easy to remember. There are no specific rules for assigning these names.

COMMON NAMES

OBJECTS			OBJECTS		
Name	Object #	Const.	Name	Object #	Const.
○ Flame Nebula	NGC2024	ORI	○○ Pinwheel/Triangulum	M33	TRI
○ Flying Minnow Ast.	STAR-4	AUR	○ Pipe Nebula	NGC6369	OPH
○ Fox Head Cluster	NGC6819	CYG	○○ Pleiades/Seven Sisters	M45	TAU
○ Frame Galaxy	NGC3621	HYA	○○ Ptolemy's Cluster	M7	SCO
○ Funnel Cloud Nebula	LG3	CYG	○○ The Pup	Cr135	PUP
○ Ghost of Jupiter/CBS Eye	3242	HYA	○ Queen's Kite Asterism	STAR-13	CAS
○○ Gloria Frederika		Ast AND	○ Realm of the Galaxies		VIR
○ Golf Putter Asterism	STAR-14	AND	○ Red Necked Emu Ast.	STAR-26	CYG
○○ Great Bird of the Galaxy	2301	MON	○ Regulus Galaxy	Leo I	LEO
○○ Great Cluster	M13	HER	○ Ring Nebula	M57	LYR
○○ Great Nebula	M42	ORI	○ Ring Tail Galaxy	NGC4038	CRV
○ Great Square		Ast PEG	○○ Rocking Horse Cluster	NGC6910	CYG
○ The Hamburger	NGC5128	CEN	○ Rosette Nebula	NGC2244	MON
○ Heart and Soul Nebulae	IC1805	CAS	○ Sailboat Cluster Ast.	STAR-6	LMI
○○ Heart Cluster	M50	MON	○ Saturn Nebula	NGC7009	AQR
○○ Helix Nebula	NGC7293	AQR	○○ Sculptor Galaxy	NGC253	SCU
○ Horsehead Nebula	IC434	ORI	○ Scutum Star Cloud		SCT
○○ Horseshoe/Omega/Swan	M17	SGR	○ Skull Nebula	NGC246	CET
○ Hubble's Variable	NGC2261	MON	○○ Small Sagittarius Star Cloud	M24	SGR
○○ Hyades/Bull's Face	Mel25	TAU	○ Sombrero Galaxy	M104	VIR
○ Iris Nebula	NGC7023	CEP	○ Southern Pinwheel Galaxy	M83	HYA
○○ Kemble's Cascade	STAR-3	CAM	○ Spindle Galaxy	M102	DRA
○ Kemble's Kite Ast.	STAR-15	CAS	○ Spirograph/Raspberry Neb	IC418	LEP
○○ Lagoon Nebula	M8	SGR	○ Starburst Galaxy	M94	CVN
○ Leo Triplet M65/M66/NGC3628		TAU	○○ Star Chain	SW of M29	CYG
○ Lion's Skin		Ast ORI	○ Stargate Asterism	STAR-20	COR
○○ Little Beehive Cluster	M41	CMA	○ Sunflower Galaxy	M63	CVN
○ Little Dumbbell Nebula	M76	PER	○○ Table/Jewel Box	NGC6231	SCO
○ Little Gem	NGC6818	SGR	○ Tom Thumb Cluster	NGC6451	SCO
○ Little Queen Asterism	STAR-25	DRA	○ Trapezium	in M42	ORI
○ Lost Galaxy	NGC4526	VIR	○○ Trifid Nebula	M20	SGR
○ Lucky 7 Asterism	STAR-29	CAS	○○ Tuft in Tail of the Dog	Cr140	CMA
○ Markarian's Chain	4374-4501	VIR	○ UFO Galaxy	NGC2683	LYN
○ Messier's Mistake	M73	AQR	○ Veil Nebula West	NGC6960	CYG
○○ Mexican Jumping Star	2362	CMA	○ Veil Nebula East	NGC6992	CYG
○ Mini-Coathanger	STAR-22	UMI	○ Virgo A/Smoking Gun	M87	VIR
○ Mirach's Ghost	NGC404	AND	○ Whale Galaxy	NGC4631	CVN
○○ Muscleman Cluster	Stk2	CAS	○ Whirlpool Galaxy	M51	CVN
○ Needle Galaxy	NGC4565	COM	○○ The White Rose	NGC7789	CAS
○○ North American Neb	NGC7000	CYG	○○ Wild Duck Cluster	M11	SCT
○○ Omega CEN Clstr	NGC5139	CEN	○ Witch's Broom Nebula	NGC6960	CYG
○ O'Niell's Cluster		κ DRA			
○ Owl Nebula	M97	UMA			
○ PacMan Nebula	NGC281	CAS			
○ Pakan's 3 Asterism	STAR-18	MON			
○ Pazmino's Cluster	Stk23	CAM			
○ Pelican Nebula	IC5070	CYG			
○ Pinwheel Galaxy	M101	UMA			

Key: ☆ – Single Star
 ☆☆ – Double or Multiple Stars
 ○ – Telescopic Objects
 ○○ – Binocular Objects
Bold – to mag 7
 STAR – Small Telescope Asterism Roster

THE SOLAR SYSTEM

- Our SUN** – a normal G2 star, one of more than 300 billion stars in the Milky Way.
 – Diameter: 865,000 miles (1,390,000 km).
 – Mass: 330,000x Earth. Density: about 1/2 ounce per cubic inch.
 – Temperature: Surface: 5800° K; Core: 15,600,000° K (27,000,000° F).
 – Age: 4.6 billion years old (only 5.5 billion years to go).

Inner Planets	Mercury	Venus	Earth	Moon	Mars
Mean distance from Sun - AU	0.387	0.723	1	238,000 mi.	1.524
Millions of miles	36	67.2	92.9	from Earth	141.7
Length of year - Earth-days	88d	225d	365d		687d
Length of day - Earth-hours	1,408	5,832	23.93	29.53d	24.62
Diameter at equator - miles	3,013	7,500	7,926	2,160	4,220
Diameter at equator - km	4,878	12,104	12,756	3,476	6,792
Mean orbital velocity - mi/sec	30.0	21.8	18.6	0.64	15
Mean orbital velocity - km/sec	47.89	35.04	29.79	1.03	24.14
Orbital eccentricity	0.2056	0.007	0.017	0.055	0.093
Inclination to the ecliptic	7.0°	3.23°	0°	1.54°	1.85°
Tilt of equator to orbit	2.0°	177.3°	23.45°	5.14°	25.19°
Mass - Earth = 1	0.06	0.82	1	0.123	0.11
Mean density - lbs/ft ³	338.8	327.7	344.6	338.9	246.5
Mean density - grams/cm ³	5.43	5.25	5.52	3.34	3.95
Surface gravity - Earth = 1	0.38	0.91	1	0.165	0.38
Known moons	0	0	1	0	2
Outer Planets	Jupiter	Saturn	Uranus	Neptune	Pluto
Mean distance from Sun - AU	5.203	9.539	19.191	30.061	39.529
Millions of miles	483.7	911.4	1,790	2,800	3,670
Length of year - Earth-years	11.86y	29.46y	84.01y	164.79y	248.54y
Length of day - Earth-hours	9.92	10.66	17.24	16.11	153.3
Diameter at equator - miles	88,700	74,901	31,765	31,644	1,454
Diameter at equator - km	142,980	120,536	51,118	50,538	2,340
Mean orbital velocity - mi/sec	8.1	6	4.2	3.3	3
Mean orbital velocity - km/sec	13.06	9.64	6.81	5.43	4.74
Orbital eccentricity	0.048	0.056	0.046	0.010	0.248
Inclination to the ecliptic	1.30°	2.49°	0.77°	1.77°	17.15°
Tilt of equator to orbit	3.12°	26.73°	97.86°	29.6°	122.46°
Mass - Earth = 1	317.89	95.18	14.53	17.14	0.002
Mean density - lbs/ft ³	83	43.06	80.5	102.3	126.7
Mean density - grams/cm ³	1.33	0.69	1.29	1.64	2.03
Surface gravity - Earth = 1	2.87	1.08	0.91	1.19	0.03?
Known moons	66	33	20	15	1

DISTANCES

- 1 astronomical unit - AU – 92,956,000 (million) miles; Earth to Sun distance.
 1 light year - LY – 63,240 AU, 5,880,000,000,000 (trillion) miles; distance light travels in one year.
 1 parsec – 206,265 AU, 3.26 LY, 19.17 trillion miles.
 1 kiloparsec – 3,260 LY, 19,170,000,000,000,000 (quadrillion) mi.
 Speed of light in a vacuum – 186,000 miles per second (300,000 km/sec).
 Closest globular to Earth – NGC 6397-ARA @ 8200 LY (southern skies only).
 Milky Way dimensions – 100,000 LY across with 200 billion stars.
 Earth to the center of Milky Way – 30,000 LY.
 Solar system orbit of Milky Way – 225,000,000 years.

26 The Solar System – Distances

MAJOR METEOR SHOWERS

Peak Date	Shower Name	Estimate per hr	Days Span	Velocity mi/sec*	Parent Comet (C:), Notes
Jan 3-4	Quadrantid	40-200+	2-3	25	Very short lived; bluish; from Boo.
Mar 22	March Geminid	40	—	—	Slow speed; discovered 1973.
Apr 18-22	April Lyrid	15-20+	4	30	C: Thatcher (1861) 415-year cycle; Bright; long lasting; oldest known.
May 4-5	Eta Aquarid	15-60	6	41	C: Halley; yellow, bright trails.
June 5	Scorpiid	20	—	—	Some fireballs.
June 7	Arietid	30-60	20	23	Slow with some fireballs.
June 9	Zeta Perseid	40	17	19	
June 23	June Bootid	Var. to 500	6	11	C: Pons (1819); moderately slow, some yellow/flashing; short paths.
June 30	June Draconid	10-100	—	—	From handle of Big Dipper.
July 28-29	South Delta Aquarid	10-25	14	25	Yellow trail, same time as Capricornids (10-35/hr).
Aug 12	Perseid	>100	10	37	C: Swift-Tuttle; yellow with trails.
Sept 30	Alpha Aquarid	>10	10	41	
Oct 7	Piscid	15	—	17	Moderate speed.
Oct 8-9	Oct. Draconid	5-1000?	5	—	Great when comet Giacobinni-Zinner is near.
Oct 20-21	Orionid	20-30	4	41	C: Halley; long trails, colors.
Nov 3-5	South Taurid	5-15	45	19	C: Encke; many fireballs.
Nov 12-13	North Taurid	5-7	40	—	
Nov 16-18	Leonid	>20	4-7	44**	C: Tempel-Tuttle, Spectacular; 33 year cycle.
Dec 13-14	Dec. Geminid	50-120	5-8	22	C: Asteroid Phaeton or Icarus? Few trails
Dec 22	Ursid	12-15	4-9	21	C: Tuttle (1790); many trails.

* The most powerful nuclear rocket motor *might* be able to produce 5mi/sec, IF it works.

** 44 miles per second = 158,400 miles per hour.

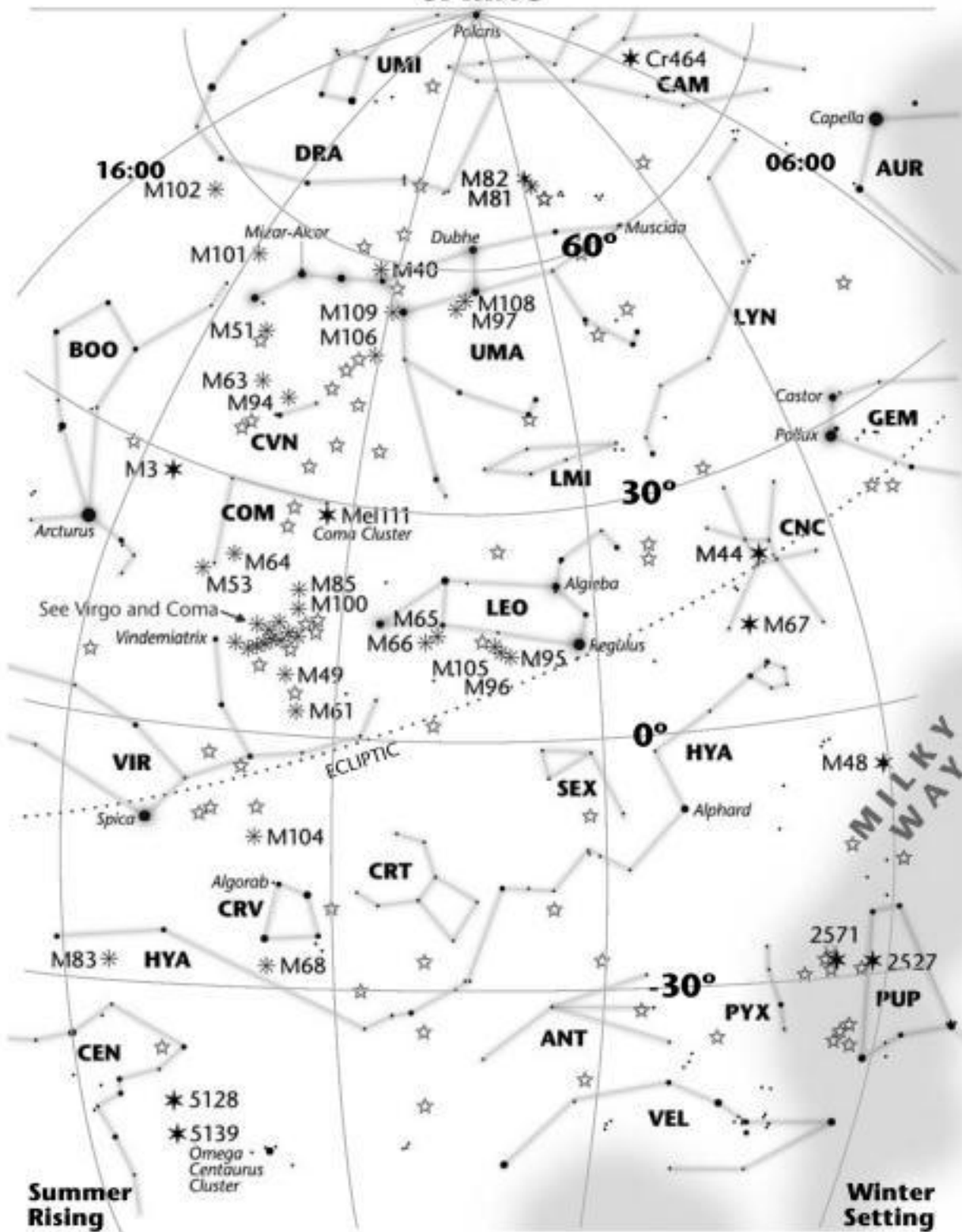
"The old moon in the new moon's arms"

Earthshine,
the reflection of
sunlight off the
earth that lights
up the dark side
of the moon on
the first day after
a new moon.



Meteor Showers 27

SPRING



Summer Rising	Right Ascension:				Winter Setting
EAST	14:00	12:00	10:00	0800	WEST
Month on Meridian: (directly overhead at ~9:00pm local time)					
June	May	April	March		

- * - Messier and other objects to mag 7
- * - Messier objects to mag 10
- ☆ - Other objects mag 7-10 (see listing)

28 Spring

SPRING

Objects to mag 7

CNC

M44

M67

CVN

M3

CEN

NGC5128

NGC5139

COM

Mel111

GEM

M35

NGC2129

Cr89

HYA

M48

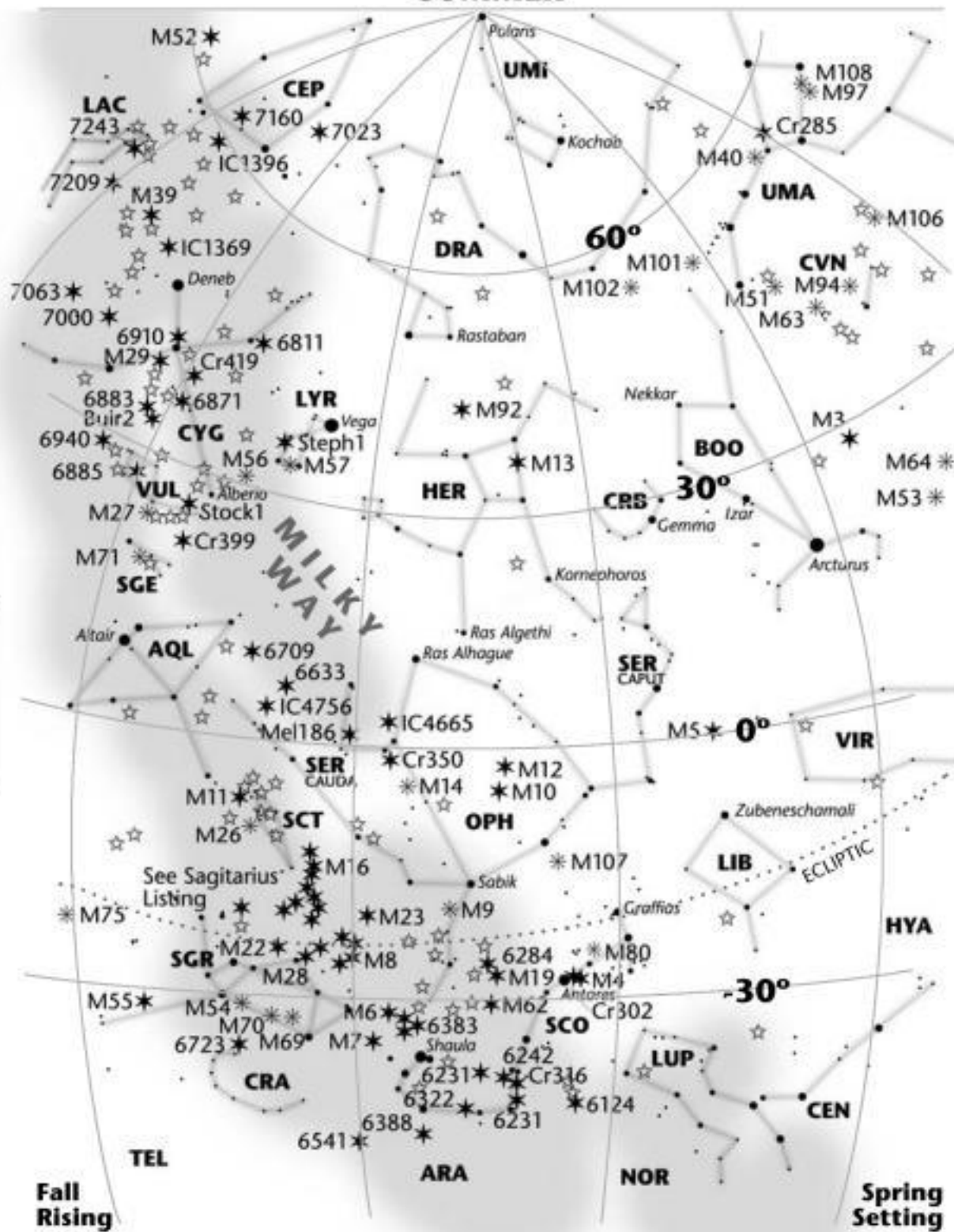
UMA

M81

Cr285



SUMMER



Fall Rising EAST Right Ascension: Spring Setting WEST

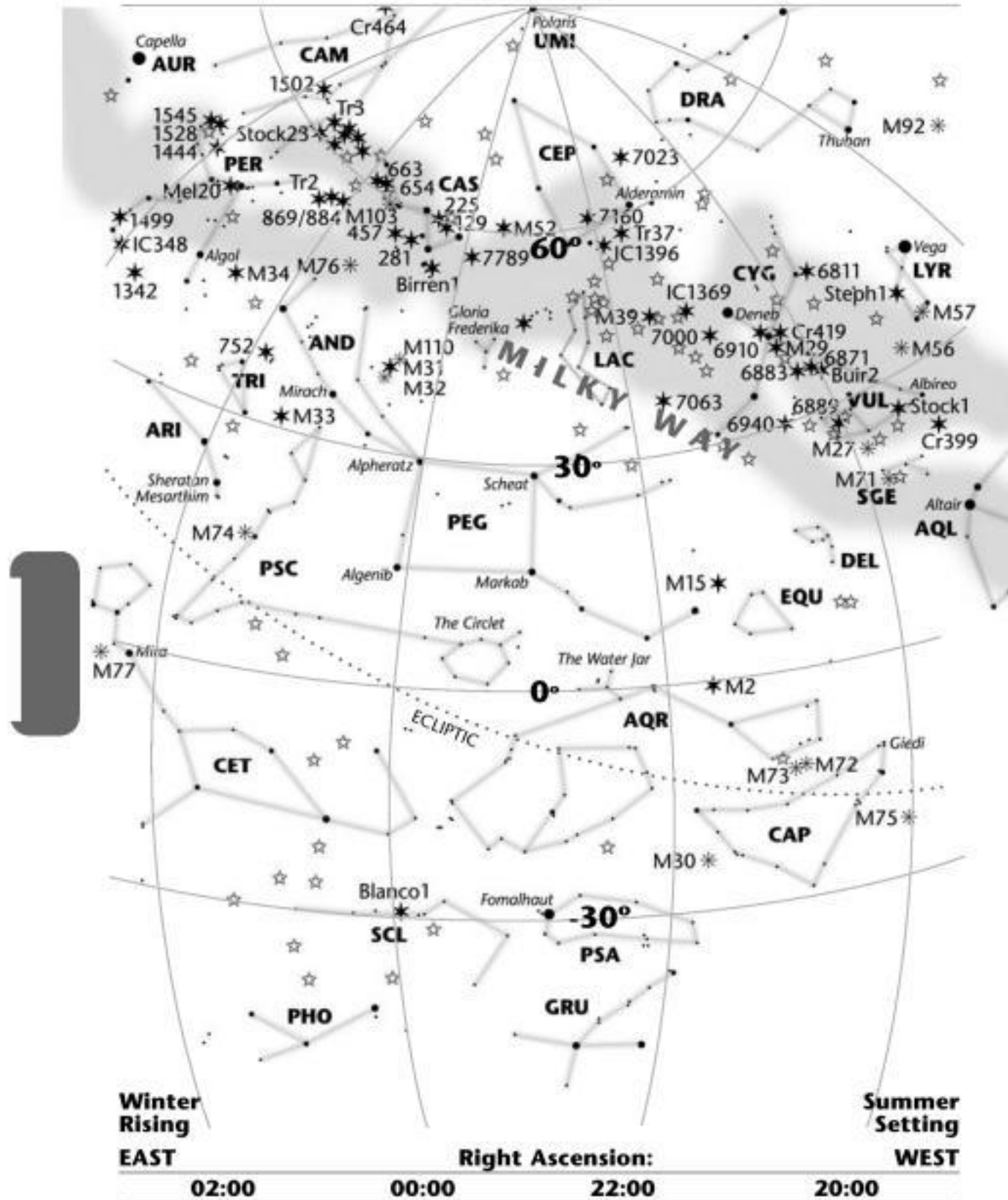
20:00	18:00	16:00	14:00
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Month on Meridian: (directly overhead at 9:00pm local time)			
September	August	July	June

- * - Messier and other objects to mag 7
- * - Messier objects to mag 10
- ☆ - Other objects mag 7-10 (see listing)

30 Summer

AUTUMN



Month on Meridian: (directly overhead at 9:00pm local time)

December	November	October	September
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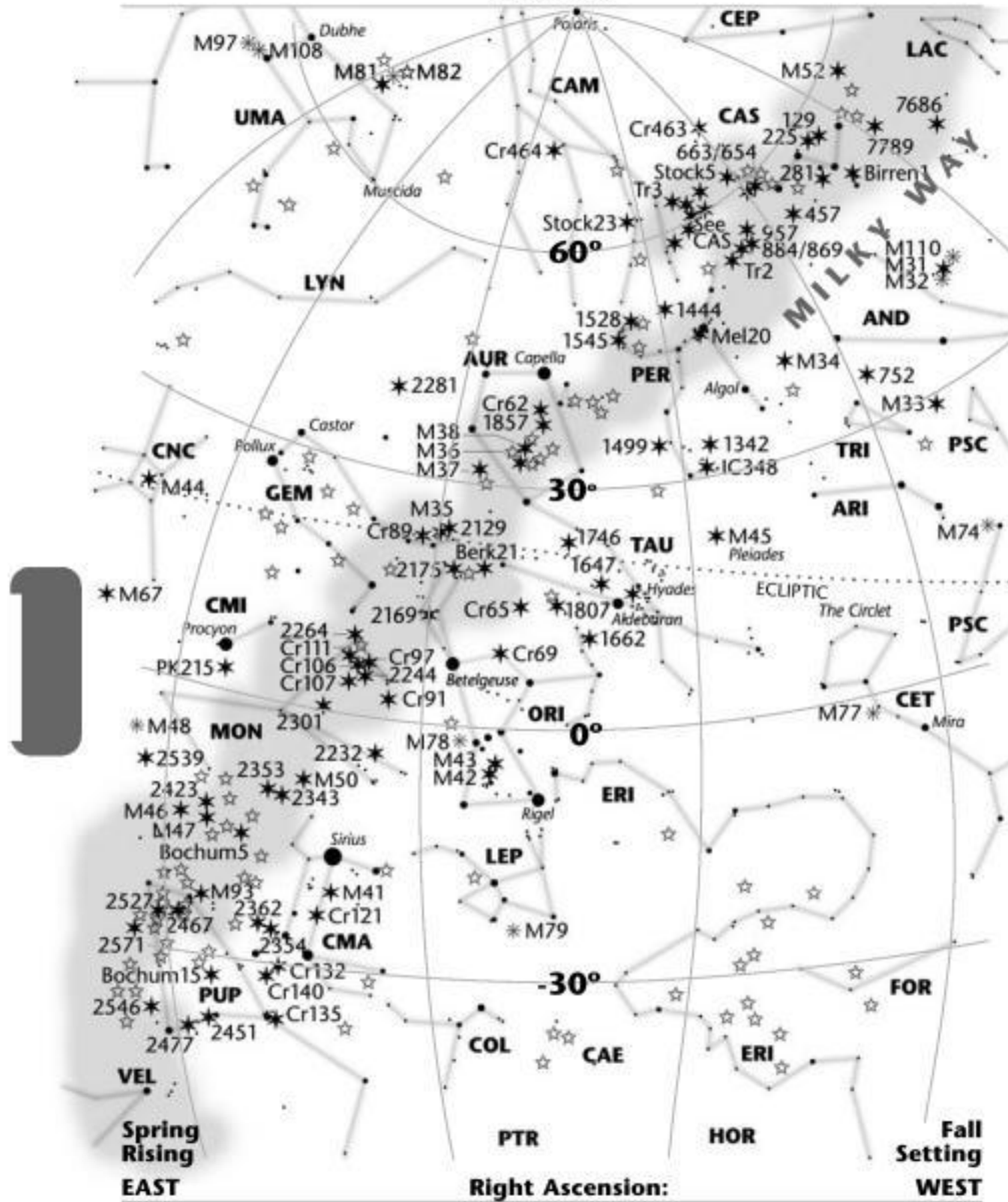
- * - Messier and other objects to mag 7
- * - Messier objects to mag 10
- ☆ - Other objects mag 7-10 (see listing)

AUTUMN

Objects to mag 7	Cr33	PEG	
AND	Cr34	M15	
M31	Tr3		
NGC7686		PER	
NGC752	CEP	M34	
	NGC5128	NGC869	
AQR	NGC5139	NGC884	
M2		NGC1342	
	CYG	NGC1444	
CAS	M29	NGC1499	
M52	M39	NGC1528	
NGC7789	NGC6811	NGC1545	
NGC129	NGC6871	Tr2	
NGC225	NGC6883	Mel20	
NGC281	NGC6910	IC348	
NGC457	NGC7000		
NGC654	Buir2	SCL	
NGC663	Cr419	Bla1	
NGC957	IC1369		
NGC1027		TRI	
Cr463	LAC	M33	
Stk5	NGC7209		
IC1805	NGC7243		
IC1848			



WINTER



Spring Rising	Right Ascension:				Fall Setting
EAST	08:00	06:00	04:00	02:00	WEST
Month on Meridian: (directly overhead at ~9:00pm local time)					
March	February	January	December		

- * - Messier and other objects to mag 7
- * - Messier objects to mag 10
- ☆ - Other objects mag 7-10 (see listing)

WINTER

Objects to mag 7	NGC2244	PUP	
AND	NGC2264	M46	
M31	NGC2301	M47	
	NGC2343	M93	
AUR	NGC2353	NGC2423	
M36	Cr91		
M37	Cr97	NGC2451	
M38	Cr106	NGC2467	
NGC1857	Cr107	NGC2477	
NGC2281	Cr111	NGC2527	
Cr62		NGC2539	
	ORI	NGC2546	
CAM	M42	NGC2571	
NGC1502	NGC1662	Cr135	
Stk23	NGC1977	Boc5	
Cr464	NGC1980	Boc15	
	NGC1981		
CMA	NGC2169	TAU	
M41	NGC2175	M45	
NGC2354	NGC2175S	NGC1432	
NGC2362	Cr65	NGC1435	
Cr132	Cr69	NGC1647	
Cr121	Cr70	NGC1746	
Cr140	Berk2	NGC1807	
		Mel25	
CMI	PER	Berk21	
PK215	M34		
	NGC869	TRI	
GEM	NGC884	M33	
M35	NGC1342		
NGC2129	NGC1444		
Cr89	NGC1499		
	NGC1528		
MON	NGC1545		
M50	Tr2		
NGC2232	Mel20		
NGC2237	IC348		

YOU PROBABLY KNOW THIS ALREADY, BUT...

What makes a good viewing night? Low humidity, little wind at the ground or aloft, little moonlight, few city lights as possible, and a wide open space for you and friends to share the evening. It's good to know when a jet stream is within 250 miles of directly overhead as that moving upper air will disturb your views. Overall, there's no substitute for time spent at the eyepiece. So take your time, there are just too many beautiful things to look at to be in a hurry.

Plan your night by having your equipment clean, collimated and ready to go. Gather your eyepieces, flashlight, books, etc., in one place so nothing is forgotten at home. Avoid TV and bright lights before going out to let your eyes adapt to the dark more readily.

Charts and star wheels are the road maps to the sky. They are useful tools, along with this book, to plan your night's viewing.

Bring a towel to dry dew-wetted things, a chair, small table, chart(s), refreshments, a hat and jacket for comfort, and insect repellent. Include a red-filtered flashlight along with paper and pencil for taking notes.

WARNING! Never look directly at the sun with a telescope or binocular unless it has a bonified solar filter!

Looking at the sun with your naked eyes can be permanently damaging. Sunlight through an eyepiece can do to your eyes what a magnifying glass does to bugs – it fries 'em!

Binoculars are the best first piece of equipment as they allow you to learn the sky easily and see objects too large for a telescope (i.e.: Cr399, the Coathanger). Sometimes a mere smudge is all that can be seen with any viewing aid. Take in a little at a time to learn a lot.

Moonwatching is best done with less than a 3/4 moon. Look for shadows and shafts of light along the terminator (the day-night line) to display the height and depth of craters and their walls.

Averted vision – looking slightly away from directly at an object – lets you detect patterns and colors that might normally be missed. Sometimes called “averted imagination.”

Collimate your reflector during setup. It really isn't that much of a chore and you reap the benefits of clearer sight.

Don't forget to align the diagonal and finder as necessary.

Let the mirror cool down. Give your glass time to fully cool for the steadiest images. Larger mirrors may take several hours.

Dirt and dust can cloud mirrors and lenses. Caring for them properly will extend the life of the coating. A dirty mirror is better than a scratched one.

Keep your equipment covered when stored. Do not store gear while it is wet. Dry wet books by standing them upright on a table and fanning the pages open.

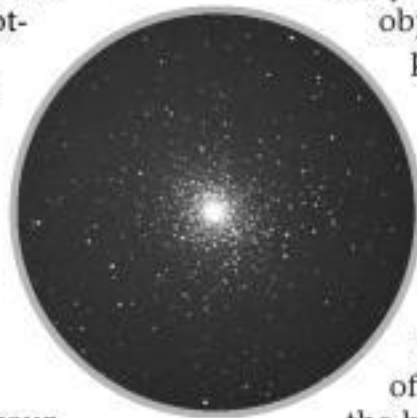
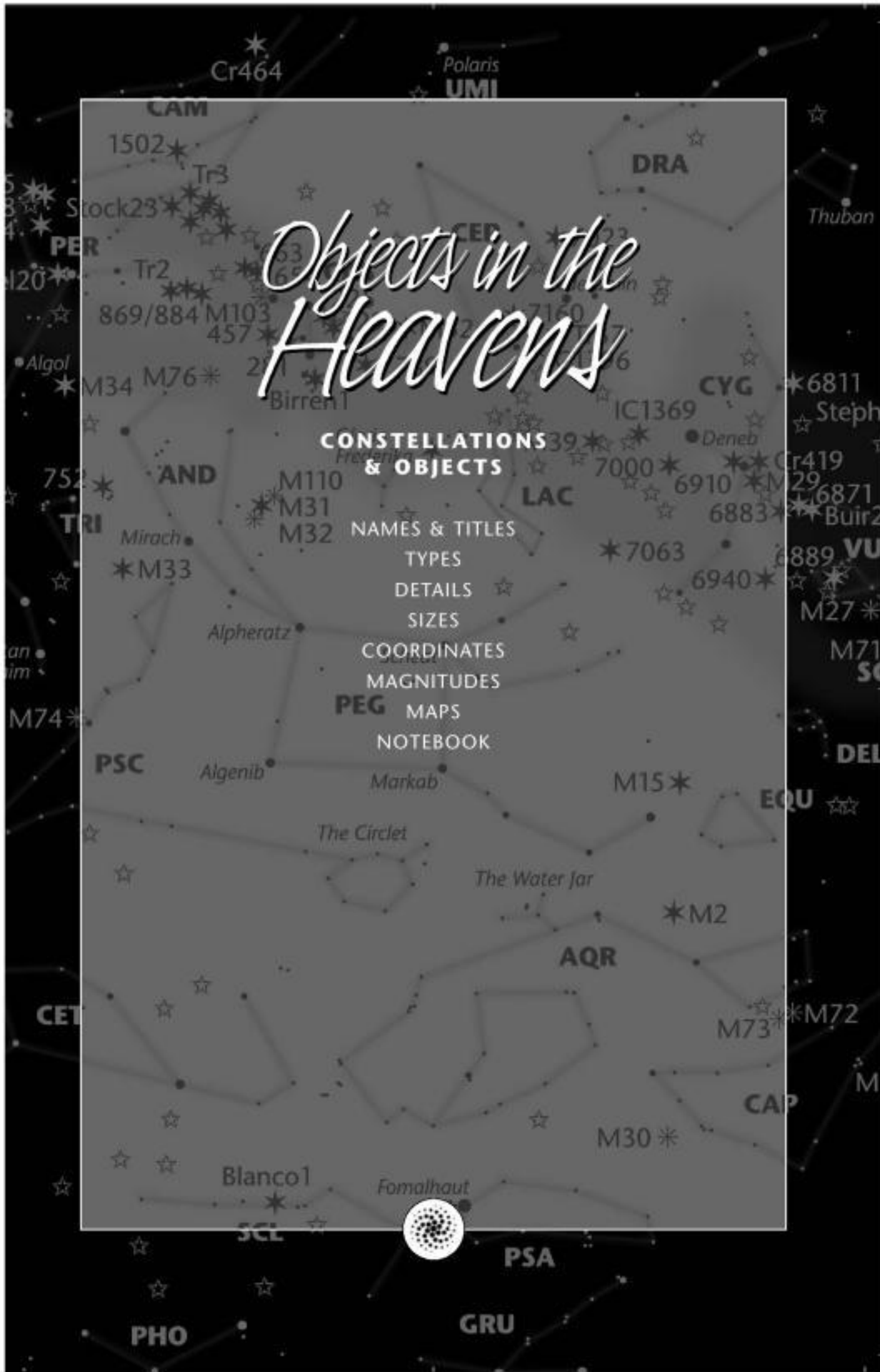


Photo: M5, an open cluster in Serpens



Objects in the Heavens

CONSTELLATIONS & OBJECTS

- NAMES & TITLES
- TYPES
- DETAILS
- SIZES
- COORDINATES
- MAGNITUDES
- MAPS
- NOTEBOOK



Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Andromeda	<i>Daughter of Cassiopeia</i>	Autumn Nov10	AND

"Rich in interesting objects of every class. Sweep in the upper part."β
 All quotes excerpted from the Rev T.W.Webb, first published in 1859.

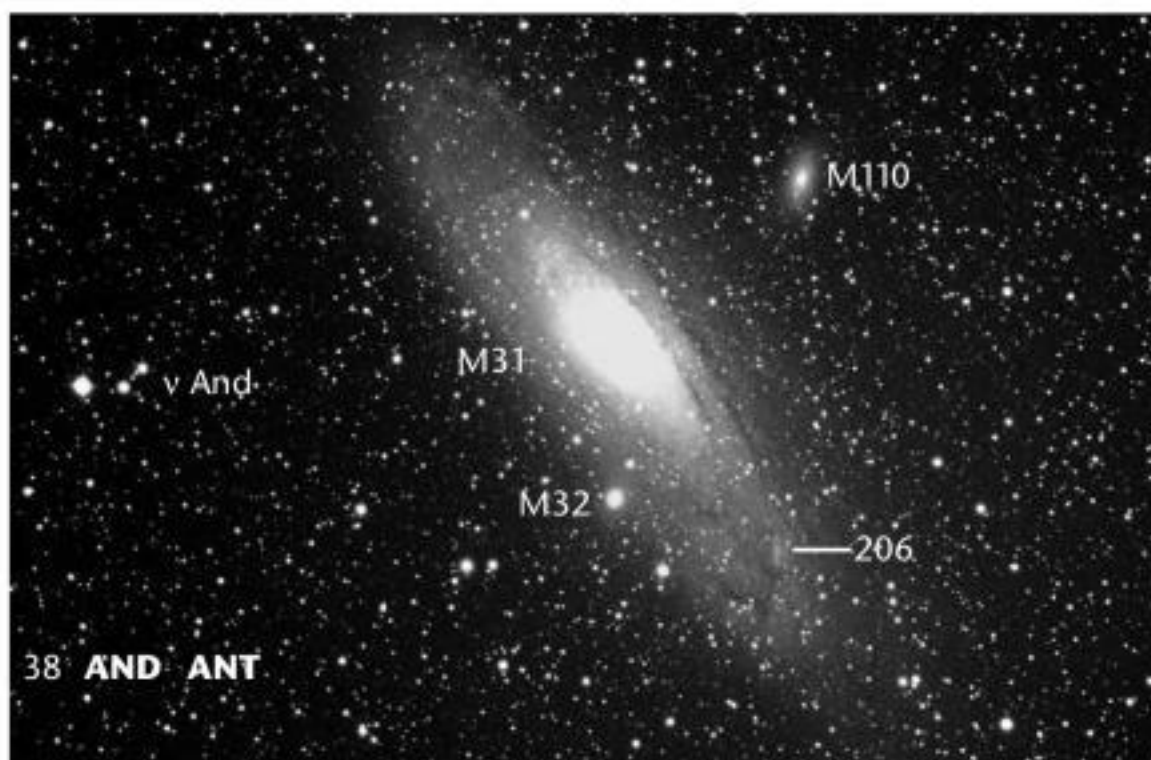
☆☆ Gamma γ	☆☆☆; orange/blue	9.8"	02:03.9	42°20'	2/5/10
☉ M31 ²²⁴	SG !!! <i>Andromeda Galaxy</i>	160x40"	00:42.7	41°16'	4.4
	Sb; 2.9 _M LY away, 120,000 _{LY} diam., 500 billion stars; Mapped by Persian astronomer Al Sufi, 10th century; M110 is 3.5° NW of core; L; nearest spiral.				
☉ M32 ²²¹	EG E2; round, bright core; L	8x6'	00:42.7	40°52'	8.5
☉ M110 ²⁰⁵	EG E6; elongated; near M31; L	17x10'	00:40.4	41°41'	8.8
☉ NGC7662	PN ! <i>Blue Snowball</i> , nebula ring	20"	23:25.9	42°33'	8.7
☉ NGC7686	OC Scattered; 12☆ mag8-13	15'	23:30.1	49°08'	5.6
☉ NGC206	OC Star cloud on S end of M31; Very faint; very large, much extended.	10'	00:40.3	41°41'	8.6
☉ NGC272	OC L-shaped asterism; 10☆	5'	00:51.4	35°50'	8.5?
☉ NGC404	SG S0; <i>Mirach's Ghost</i> ; 7' NE of β	6x6'	01:09.4	35°43'	10.3
☉ NGC752	OC Open; loose; bright cluster; Orange ☆☆ nearby; 70☆; best in binocs or refractor.	60'	01:57.8	37°41'	5.7
☉ NGC891	SG ! Sb; Classic edge-on	13x2.5'	02:22.6	42°21'	9.9
☉ NGC956	OC Irregular; round; 50-100☆	8'	02:32.5	44°37'	8.9
☉ <i>Gloria Frederika</i>	Asterism near NGC7662	—	23:43.0	46°00'	—
☉ STAR-14	Ast <i>Golf Putter</i> asterism	20x95'	01:52.5	37°30'	—

Antlia	<i>the Air Pump</i>	Spring Apr5	ANT
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Part of the original *Argo Navis*. (see page 9)

☉ NGC2997	SG Sc; face-on spiral; bright core	9x7'	09:45.6	-31°11'	9.4
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Galaxy designations, p.18 L – Member of Local Group



Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG

Aquarius *the Water Carrier* Autumn Oct10 **AQR**

"A dull looking constellation but well repaying telescopic research."

☆☆ Zeta	ζ	Close pair; both white	1.8"	22:28.9	-00°01'	4/4.5
☆☆ 41		Topaz/blue	5"	22:14.0	-21°04'	5.5/7
☆☆ 94		Light yellow/blue; contrasty	12.7"	23:19.1	-13°28'	5/7
○ M2 7089	GC	Well resolved; 36,000LY; Over 100,000☆; intense core; many red, yellow giants.	12.9'	21:33.5	-00°49'	6.5
○ M72 6981	GC	Well resolved; rich; 60,000LY; Non-symmetrical globular with bright core.	6'	20:53.5	-12°32'	9.2
○ M73 6994	Ast	Messier's Mistake, 4☆; triangle	3'	20:59.0	-12°38'	9.0
○ NGC7009	PN	!! Saturn Nebula, sm.green oval	25"	21:04.2	-11°22'	8.5
○○ NGC7293	PN	!! Helix Nebula, see in binocs?; Nearest PN at 700LY; 3LY across; filtering helps.	12'	22:29.6	-20°48'	6.5

Aquila *the Eagle* Summer Aug30 **AQL**

"All the Galaxy here is strewn with pairs and groups of stars."

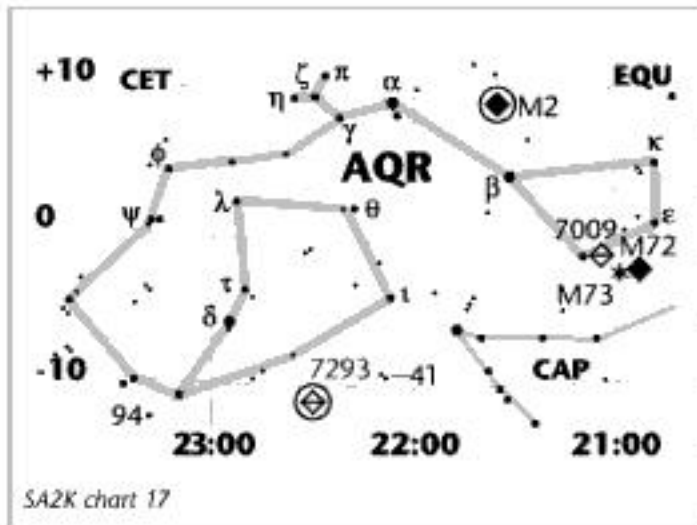
☆☆ Altair	α	Optical binary; 16LY; 6.5 hrs. full rotation, our sun rotates in 25.4 days.	165"	19:50.8	08°52'	.8/10
☆ Eta	η	Short period variable, 7 days		19:52.5	01°00'	3.5-4
☆ Nu	ν	Carbon, dark red		19:04.0	-05°42'	6.5
☆☆ Pi	π	Fine test for 3" reflectors	1.4"	19:49.0	11°48'	6/6.8
☆☆ 57		Pale yellow/pale green	36"	19:54.0	-08°16'	6/6.6
☆☆ Σ2404		In center of 4☆, both orange	3.6"	18:50.8	10°59'	5.2
○○ NGC6709	OC	Pretty round; irregular	13'	18:51.5	10°21'	6.7
○ NGC6724	OC	Ring-shaped; 10☆	4'	18:57.0	10°22'	10.0
○ NGC6738	OC	Poor; scattered	15'	19:01.4	11°36'	8.3
○ NGC6755	OC	Small double cluster with NGC 6756 in field (4'; mag10.6).	15'	19:07.8	04°14'	7.5
○ NGC6760	GC	Sparse but identifiable	6.6'	19:11.2	01°02'	8.5
○ Cr401	OC	Beautiful sweeping area	1'	19:38.4	00°20'	7.0
○ Pal11	GC	Lg hazy region; nice ☆☆ north	10'	19:45.2	-08°00'	10.0

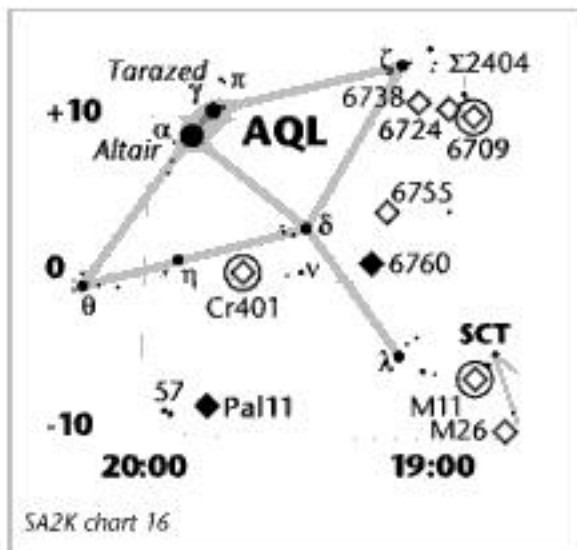
Aries *the Ram* Autumn Dec10 **ARI**

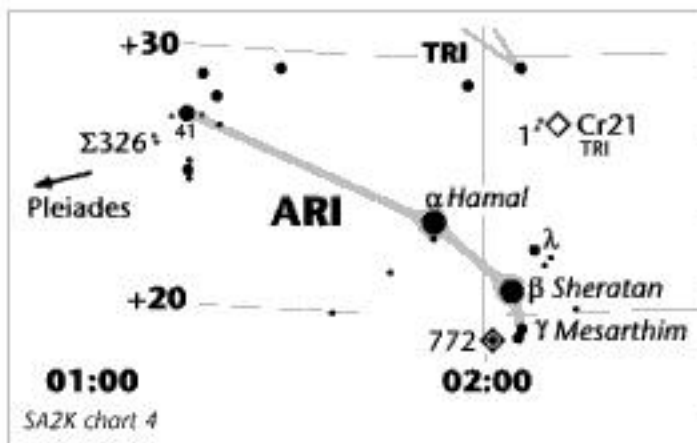
"Three stars together mark it, but it reaches further east into a dull region."

☆☆ Mesarthim	γ	Matched white ☆; 200LY; One of earliest ☆☆ to be discovered (Hooke, 1664).	7.7"	01:53.5	19°18'	5/5
☆☆ Lambda	λ	Yellow/purple (blue?)	37"	01:57.9	23°36'	5/7.7
☆☆ 1		Gold/blue	3"	01:50.1	22°17'	6/7.5
☆☆ Σ326		Orange/dull red	5.9"	02:55.6	26°52'	7/9
○ NGC772	SG	Sb; 2° SE of β; 200,000LY wide	7x4'	01:59.3	19°01'	10.3

Galaxy designations, p.18







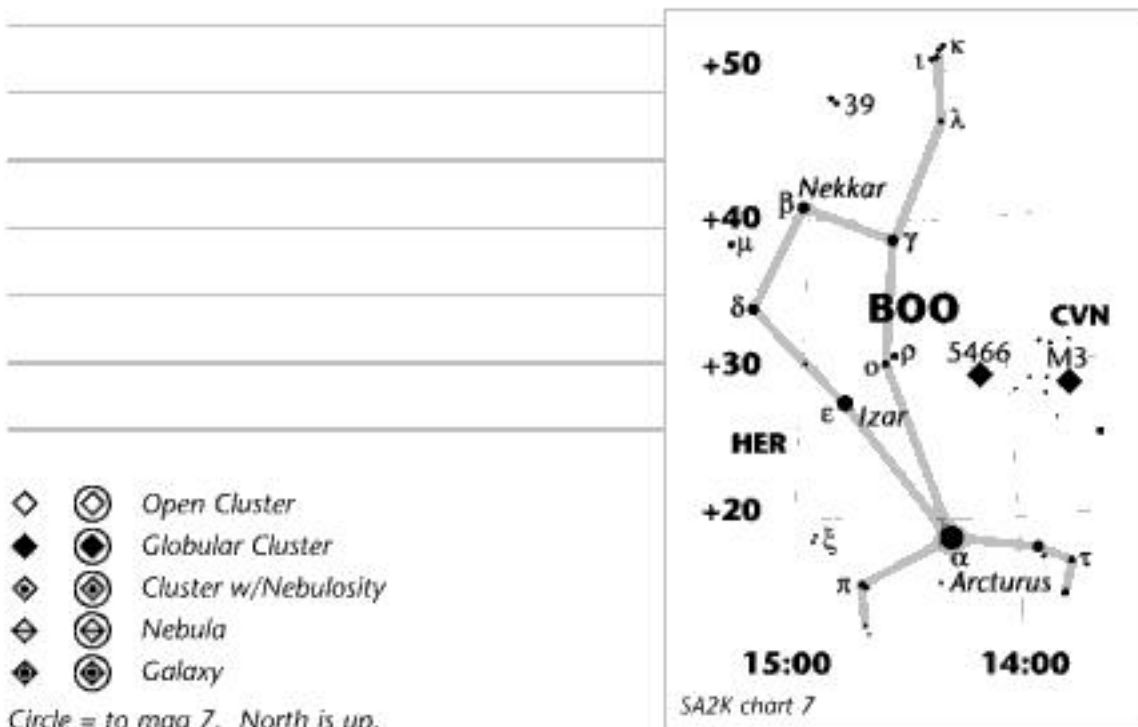
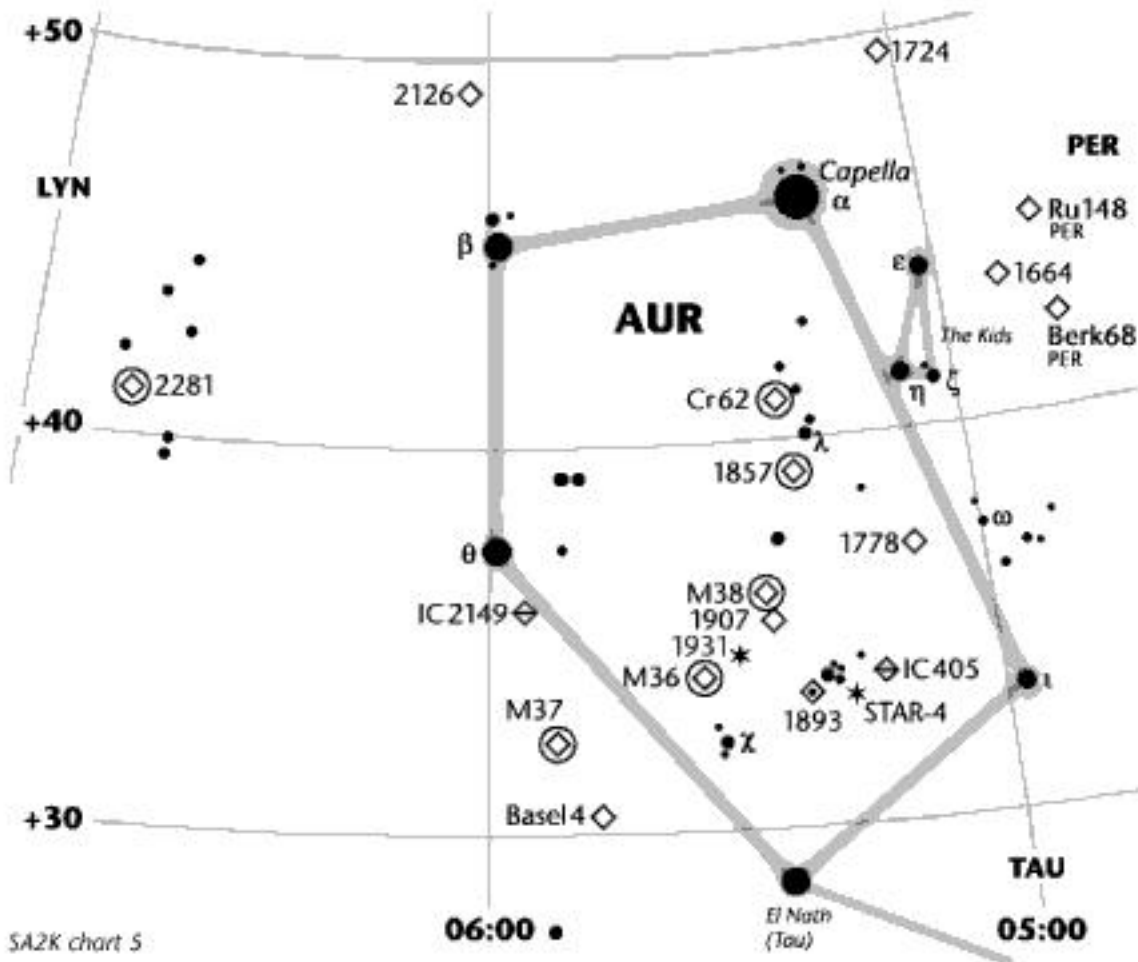
- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ○ Galaxy

Circle = to mag 7. North is up.

AQR AQL ARI 41

Objects in the Heavens

CONSTELLATION	COMMON NAME		SEASON, ON MERIDIAN		ABBREVIATION	
ITEM IDENTIFIER	TYPE	DETAILS	SIZE	RA	DEC	MAG
Auriga		<i>the Charioteer</i>	Winter	Jan30		AUR
<i>"The objects are distant and differ in colour, maybe influencing size estimates."</i>						
☆ <i>Capella</i>	α	<i>The She-Goat</i> ; golden yellow		05:16.7	46°00'	.06
☆ <i>Almaaz</i>	ε	Largest ☆; 2,700x our Sun; Northernmost of <i>The Kids</i> ; long period variable.		05:01.9	43°49'	3.0
☆☆ <i>Theta</i>	θ	Bluish/bluish; difficult	3.6"	05:59.7	37°13'	2.6/7
○○ M36 1960	OC	60☆ very regularly arranged; Easy; 150☆ to mag12.5; 4,600LY.	12'	05:36.1	34°08'	6.1
○○ M37 2099	OC	! Beautiful; dense; 150☆; Red ☆ center; area appears strewn with gold dust.	24'	05:52.4	32°33'	5.8
○○ M38 1912	OC	Pi shaped; 100☆; near NGC1907	21'	05:28.7	35°50'	6.9
○ NGC1664	OC	Open; ☆☆ and chains	18'	04:51.1	43°41'	7.6
○ NGC1724	OC	Small half-ring of ☆	2'	05:03.5	49°30'	10.0
○ NGC1778	OC	2 rows of ☆; pretty ☆☆	7'	05:08.1	37°01'	7.7
○ NGC1857	OC	Splendid region; rich	6'	05:20.1	39°21'	7.0
○○ NGC1893	C/N	Rich, little compressed	12'	05:22.7	33°25'	7.5
○○ NGC1907	OC	40☆ in curves; near M38	6'	05:28.1	35°20'	8.2
○ NGC1931	ER	Haze around 4 close ☆; Contains ☆☆☆ ADS4112.	3x3'	05:31.4	35°15'	9.9
○ NGC2126	OC	20☆; faint; poor; blue-white	6.5'	06:02.5	49°52'	10.0
○○ NGC2281	OC	Bright; scattered	15'	06:49.3	41°04'	5.4
○ STAR-4	Ast	<i>Flying Minnow</i> ; yellow/blue	75'	05:15.0	32°40'	5/7/11
○ IC405	Neb	<i>Flaming Star Nebula</i> ; diffuse	18x30'	05:17.4	34°23'	10.0
○ Cr62	OC	Near NGC1857	28'	05:22.5	41°00'	4.2
○ Basel4	OC	Small; very faint; 8☆ at 126x	8'	05:48.5	30°13'	9.1
○ IC2149	PN	Very bright	12x6"	05:56.4	46°06'	10.0
Boötes		<i>the Herdsman</i>	Summer	Jun15		BOO
<i>"A fine constellation... a noble object at all times. Boötes is rich in pairs, poor in clusters and nebulae."</i>						
☆ <i>Arcturus</i>	α	<i>Guardian of the Bear</i> ; topaz; First ☆ seen in daylight with telescope (1635); 80x brighter than sun; 37LY.		14:15.9	19°11'	-0.1
☆☆ <i>Delta</i>	δ	Yellow/blue	105"	15:14.0	34°00'	3.5/7
☆☆ <i>Izar</i>	ε	☆☆☆, orange/green;	2.8"	14:44.9	27°05'	2.4/5
☆☆ <i>Asellus Secundus</i>	ι	Yellow/white	38"	14:16.2	51°22'	5/7.5
☆☆ <i>Pi</i>	π	Both white	5.6"	14:40.7	16°25'	5/5.8
☆☆ <i>Xi</i>	ξ	Yellow/purple; good contrast	6.9"	14:51.4	19°06'	4.7/7
☆☆ <i>Alkalurops</i>	μ	☆☆☆	2"/108"	15:24.5	37°23'	4/7/7
☆☆ <i>Asellus Tertius</i>	κ	White/blue; very fine	13.4"	14:13.5	51°47'	5/6.6
☆☆ 39		Fine color contrast	3"	14:50.0	48°43'	6/6.8
○ NGC5466	GC	Faint white cloud, very rich	11'	14:05.5	28°32'	9.0



- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ○ Cluster w/Nebulosity
 - ◇ ○ Nebula
 - ◆ ○ Galaxy
- Circle = to mag 7. North is up.

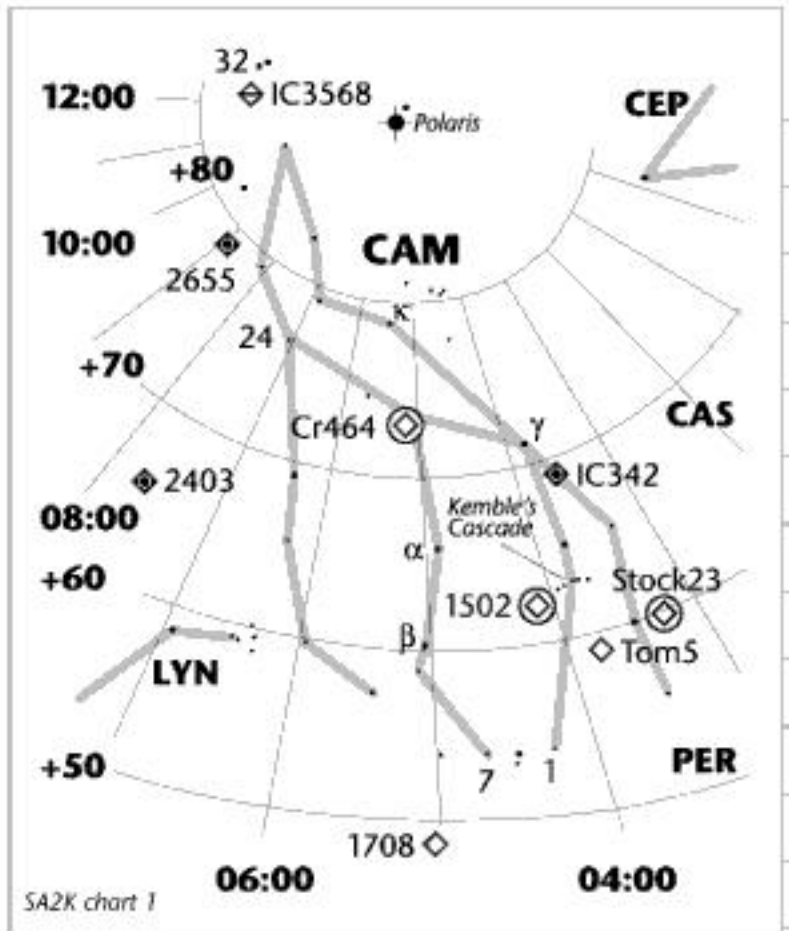
AUR BOO 43

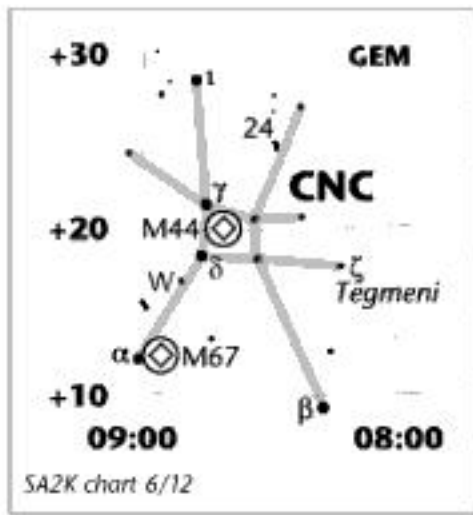
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Camelopardalis	<i>the Giraffe</i>	Winter Feb1	CAM
<i>"Wide spread, obscure; but containing many good objects."</i>			
☆☆ 1	White/lt blue, splits at 100x	10.3" 04:32.0 53°55'	5.7/7
☆☆ 24	☆☆☆	2"/108" 12:35.1 18°23'	5/6
☆☆ 32	Near IC3568	21.6" 12:49.2 83°25'	5.3/6
☆☆ Σ485	In NGC1502	18" 04:08.0 62°20'	7/7.1
○○ NGC1502	OC Small group E end of <i>Kemble's</i>	8° 04:07.8 62°20'	5.8
○ NGC1708	OC Loose, rich, fills field	20' 05:02.8 52°53'	9.0
○○ NGC2403	SG ! Sc; knotty; irregular arms; Pinwheel-type galaxy in M81 Group-UMA.	15x5' 07:36.9 65°36'	8.4
○ NGC2655	SG Sa; large nucleus; faint whirls	5x4' 08:55.6 78°13'	10.1
○○ Stk23	OC <i>Pazmino's Cluster</i> ; row of 3☆ inv.	15' 03:16.0 60°02'	6.2
○ IC342	SG Sc; brighter nucleus; L; Slightly farther than M31; 10° above the Galactic Plane.	15' 03:46.8 68°06'	8.8
○ Tom5	OC 25-30☆ mag11 and fainter	17' 03:47.8 59°03'	8.4
○○ STAR-3	Ast <i>Kemble's Cascade</i> ; 20☆ chain	3° 04:00.0 63°00'	5.8
○ Cr464	OC 2 nested curves of ☆ inside	2° 05:22.0 73°00'	4.2
○ IC3568	PN Blue-green; use hi-power	40x35" 12:32.9 82°33'	9.5

Galaxy designations, p.18 L – Member of Local Group

Cancer	<i>the Crab</i>	Spring Mar15	CNC
<i>"Marked only to the naked eye by the remarkable cluster Præsepe."</i>			
☆☆ Tegmeni ζ	☆☆☆, fine yellow/orange	1"/5" 08:12.2 17°39'	5/6/6
☆☆ Iota ι	☆☆☆, orange/blue	31" 08:44.0 28°55'	4/6.6
☆ Asellus Borealis γ	Frequently occulted by Moon	08:43.3 21°28'	4.6
☆☆ 24	Both yellow; splits at 135x	6" 08:27.0 24°33'	7/7.6
☆ X	Binoc. variable, 170 days; semi-regular	08:49.0 17°00'	9.3-11
○○ M44 ²⁶¹²	OC !! <i>Præsepe/Beehive/Manger</i> ; "Full of fine combinations; two notable triangles." 500LY; Galileo first to see, counted 36☆ through a telescope; 200☆.	95' 08:40.1 19°59'	3.5
○○ M67 ²⁶⁸²	OC ! Dense; 500☆; 2700LY; Use low power; dark spot near center; surrounded by semi-circle of brighter stars; nebulous in small telescopes. 5 times farther than M44; 3.2 billion years old.	29' 08:50.4 11°49'	6.5





- ◇ ⊙ Open Cluster
 - ◆ ⊙ Globular Cluster
 - ◇ ⊙ Cluster w/Nebulosity
 - ◇ ⊙ Nebula
 - ◆ ⊙ Galaxy
- Circle = to mag 7. North is up.

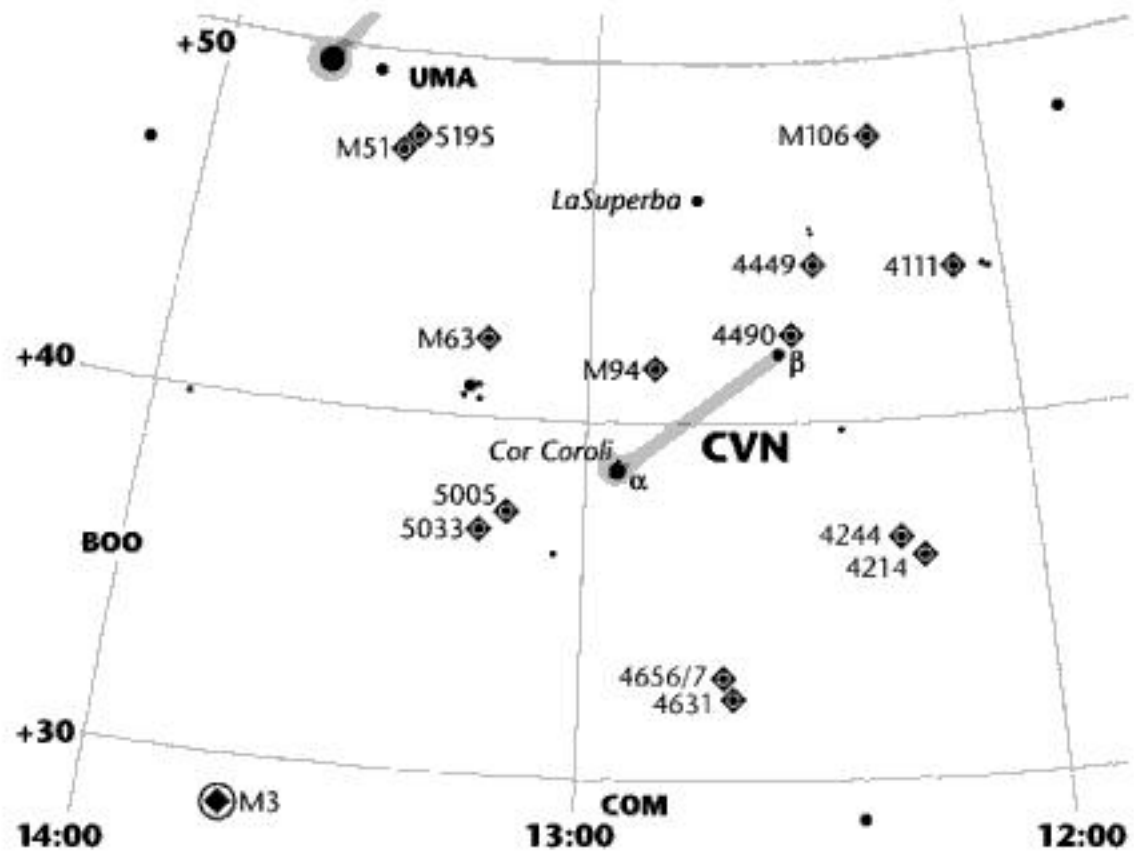
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Canes Venatici	<i>the Hunting Dogs</i>	Spring May20	CVN
<i>"The nebulae here are fine. The only prominent star is Cor Caroli."</i>			
☆☆ Cor Caroli α	Heart of Charles; blue/white	19.4" 12:56.0 38°19'	3/5.5
☆ LaSuperba γ	Reddest of naked-eye ☆; variable	12:45.1 45°26'	5-6.4
○○M3 5272	GC ! Dark marks; intense core; 500,000+ ☆; 190 variable ☆; 100,000LY away; 150LY across.	19' 13:42.2 28°23'	6.2
○ M51 5194	SG Sc; Whirlpool Galaxy; 37MLY; Classic spiral; look for dimmer NGC 5195 nearby.	11x7' 13:29.9 47°12'	8.2
○ M63 5055	SG Sb; Sunflower Galaxy; large halo	10x6' 13:15.8 42°02'	8.8
○ M94 4736	SG Sb; Starburst Galaxy; Small; bright; nebulous; defies moonlight; 15MLY.	12x9' 12:50.9 41°07'	8.0
○ M106 4248	SG ! Sbp; bright knots; extended; Very bright, tight nucleus; 2 arms; 25MLY.	17x7' 12:19.0 47°18'	8.5
○ NGC4111	SG E7; starlike outer arms	4x1' 12:07.0 43°04'	9.9
○ NGC4214	IG Irr; large	8x7' 12:15.6 36°20'	9.7
○ NGC4244	SG Sb; large; distinct; edge-on	16x2.5' 12:17.5 37°49'	10.2
○ NGC4449	IG Irr; rectangular; very knotty	6x5' 12:28.2 44°06'	9.4
○ NGC4490	SG Sc; long; easily resolvable; Pear shaped. Cocoon Galaxy, NGC4485 nearby (mag12.3).	5x2' 12:30.6 41°39'	9.7
○ NGC4631	SG ! Sc? Whale Galaxy; Huge, edge-on barred.	15x3' 12:42.1 32°32'	9.3
○ NGC4656/7	IG Ip; NE end curves up	14x3' 12:44.0 32°10'	10.4
○ NGC5005	SG Sb; elongated; near α	6x3' 13:10.9 37°03'	9.8
○ NGC5033	SG Sb; bright needle; elongated	10x4' 13:13.5 36°36'	10.0
○ NGC5195	IG Irr; companion of M51	6x5' 13:30.0 47°16'	9.5

Galaxy designations, p.18

NGC4490-CVN with the fainter associate NGC4485





SA2K chart 7

- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ○ Cluster w/Nebulosity
 - ◇ ○ Nebula
 - ◆ ○ Galaxy
- Circle = to mag 7. North is up.

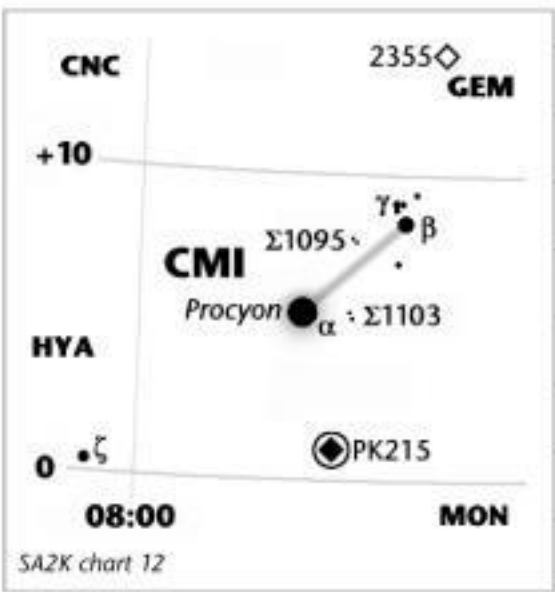
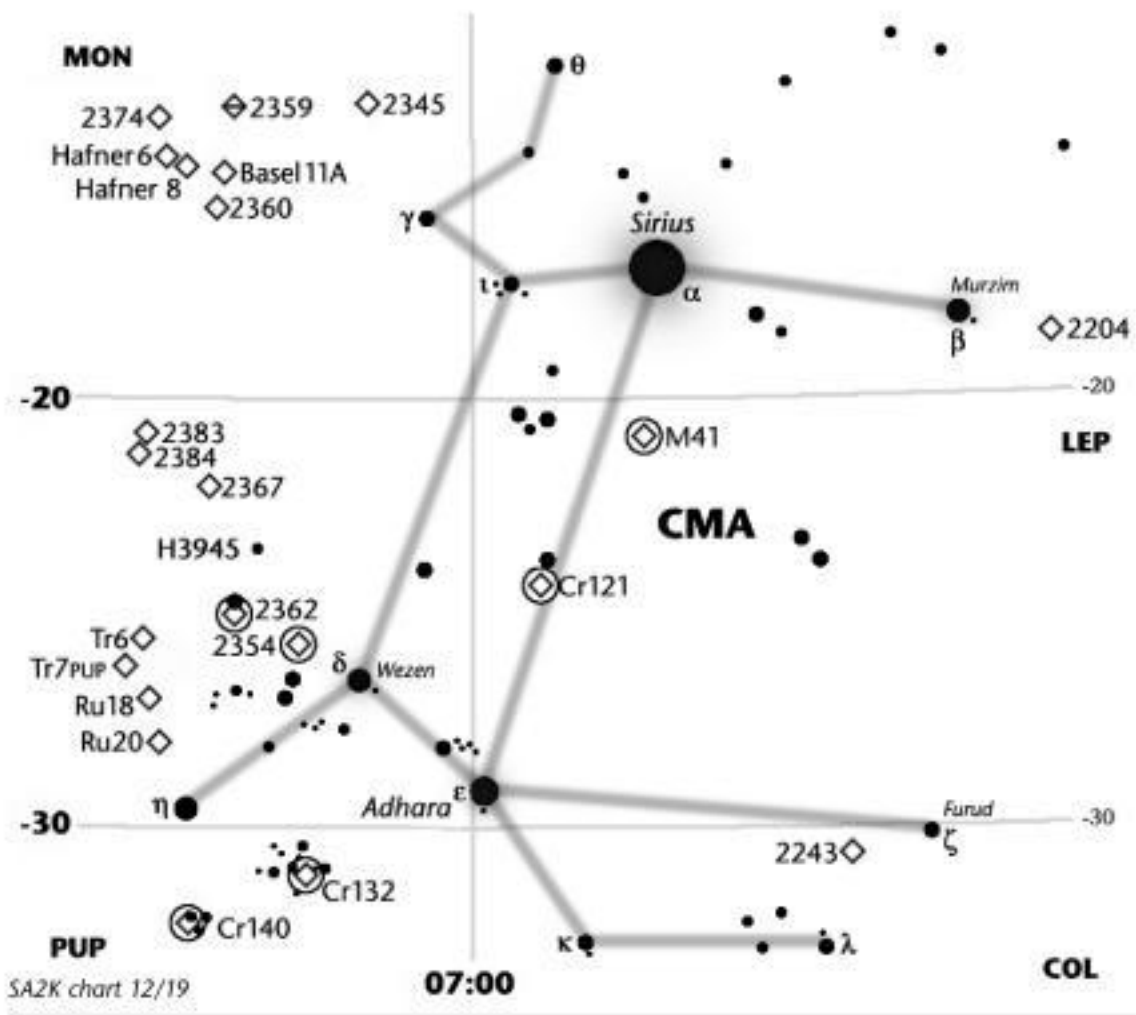
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Canis Major	<i>the Large Dog</i>	Winter Feb15	CMA
<i>"Sirius is the leader of the host of heaven; a glorious object."</i>			
☆ Sirius	α <i>The Dog Star, Sparkling One;</i> Beautiful colors; faint ☆☆; part of Winter Triangle; #1 brightest as seen from Earth; 4th nearest at 8.6LY.	06:45.3 -16°43'	-1.46
☆☆ Adhara	ε Good contrast	7.5" 06:58.6 -28°58'	1.5/7
☆☆ H3945	<i>Winter Alberio</i> ; colorful	26" 07:16.6 -23°19'	4.8/6
○○ M41 2287	OC ! <i>Little Beehive</i> ; 100☆; 2200LY	38' 06:47.0 -20°44'	4.5
○ NGC2204	OC Large; round; irregular	10' 06:15.5 -18°40'	8.6
○ NGC2243	OC Pretty bright; small; rich	4' 06:29.8 -31°17'	9.4
○ NGC2345	OC Pretty large and rich	12' 07:08.3 -13°12'	7.7
○ NGC2354	OC Rich; little compressed; 60☆	12' 07:14.3 -25°44'	6.5
○ NGC2359	EN <i>Duck Nebula/Thor's Helmet</i> ; Very fine object; large; bright.	8x6' 07:18.6 -13°12'	—
○○ NGC2360	OC Rich; compressed; 50☆	13' 07:17.7 -15°38'	7.2
○ NGC2362	OC Dense; 40 ☆/☆☆ in a 6"; Tau-CMA Cluster; <i>Mexican Jumping Star</i> ; compare NGC2264-MON; Youngest known cluster, about 1 million years old.	8' 07:18.8 -24°57'	4.1
○ NGC2367	OC Small; poor; little compressed	3.5' 07:20.1 -21°53'	7.9
○ NGC2374	OC Very large; rich	19' 07:23.9 -13°16'	8.2
○ NGC2383	OC 50☆; condensed; small	6' 07:24.7 -20°57'	8.4
○ NGC2384	OC Little compressed; ☆☆ inv.	2.5' 07:25.2 -21°01'	7.4
○○ Cr121	OC Sigma CMA cluster; 20☆	50' 06:54.2 -24°38'	2.6
○ Cr132	OC 25☆; 1500LY	95' 07:14.4 -31°10'	3.6
○ Bas11A	OC Bright stars in rich area; dipper	9' 07:17.1 -13°58'	8.2
○ Haf6	OC In field with NGC 2375/2359	4' 07:20.1 -13°08'	9.2
○ Haf8	OC 6-7☆; faint glow	4.2' 07:23.4 -12°20'	9.1
○○ Cr140	OC <i>Tuft in the Tail of the Dog</i> ; 1.5x moon diam; ~30☆; 1000LY; wide ☆☆ at 99" sep.	42' 07:23.9 -32°12'	3.5
○ Ru18	OC Interesting pattern; rich field	4' 07:24.8 -26°13'	9.4
○ Tr6	OC In field with Tr7-PUP	6' 07:26.1 -24°18'	10.0
○ Ru20	OC Few bright ☆ in rich field	10' 07:26.7 -28°53'	9.5

Canis Minor *the Small Dog* Winter Mar1 **CMI**

"Vicinity of Procyon very rich in small pairs and triplets."

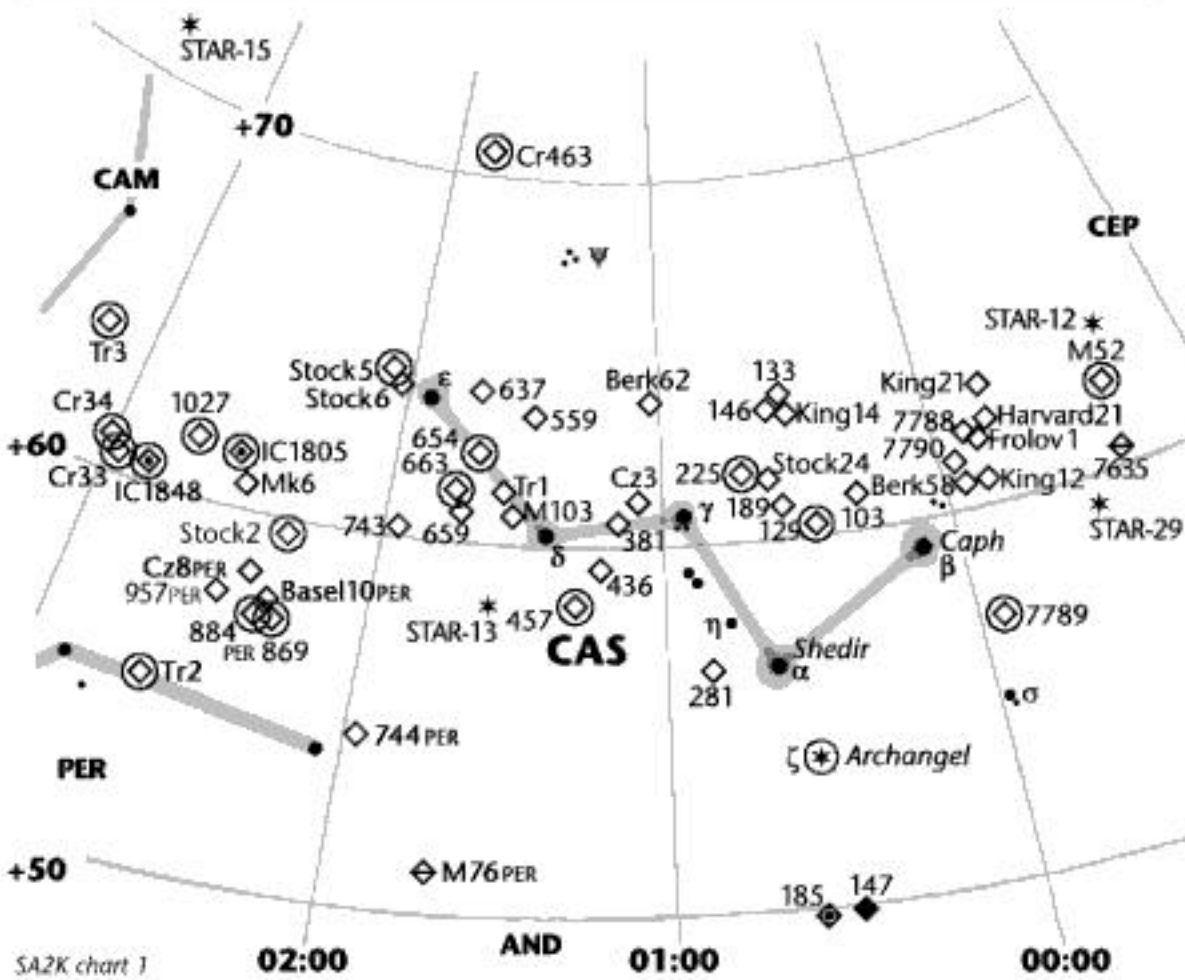
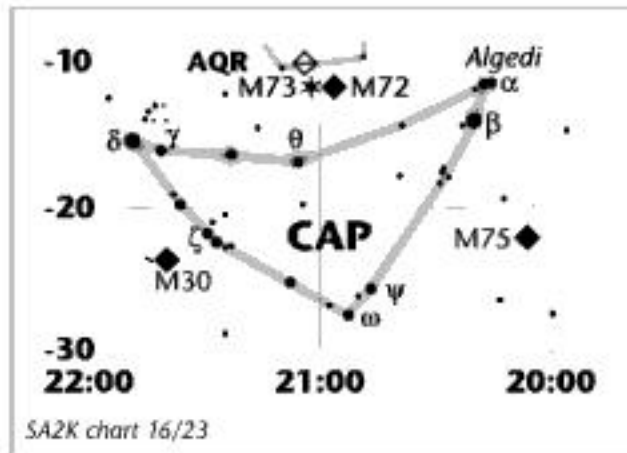
☆ Procyon	α <i>The Little Dog</i> ; 8th brightest ☆; 5th closest to Earth at 11.4LYfaint binary ☆☆.	07:39.3 05°13'	0.38
☆☆ Σ1095	White/bluish	10.1" 07:27.4 08°45'	8.5-9
☆☆ Σ1103	Yellowish/bluish-white	4.4" 07:30.6 05°15'	7-8.5
○ PK215+11.1	GC Kohoutek discovery (1963)	4.3' 07:35.5 02°49'	5.4



- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ○ Cluster w/Nebulosity
 - ◇ ○ Nebula
 - ◆ ● Galaxy
- Circle = to mag 7. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Capricornus	<i>the Sea-Goat</i>	Autumn Sep20	CAP
<i>"Not a conspicuous constellation, but containing some good objects."</i>			
☆☆ Al Giedi	α The Goat; both yellow; Naked-eye; very fine double-double.	6' (378") 20:18.1 -12°33'	3.6/4
☆☆ Dabih	β Orange/blue	206" 20:21.0 -14°47'	3.4/6
○ M30 ⁷⁰⁹⁹	GC Slightly oval; highly resolved	11' 21:40.4 -23°11'	7.6
○ M75 ⁶⁸⁶⁴	GC (nearby in Sagittarius)	6' 20:06.1 -21°55'	8.5
Cassiopeia	<i>the Queen of Ethiopia</i>	Autumn Nov20	CAS
<i>"Here lies a multitude of superb Galaxy fields."</i>			
☆☆ Achird	η Fine binary; yellow/purple	12" 00:49.1 57°49'	3/7.5
☆☆ Iota	ι ☆☆☆; yellow/blue/blue	6" 02:29.1 67°24'	5/7/8
☆☆ Sigma	σ Green/blue; fine field	3" 23:59.0 55°45'	5/7.1
○○ M52 ⁷⁶⁵⁴	OC Large; rich; faint; 120☆; near 7635	13' 23:24.2 61°35'	7.0
○○ M103 ⁵⁸¹	OC 40 brighter ☆; wedge-shaped; 1° NE of δCAS; 8MLY; 3 NGC clusters nearby.	6' 01:33.2 60°42'	7.4
○ NGC7635	Neb Bubble Nebula; diffuse	15x8' 23:20.7 61°12'	8.5
○ NGC7788	OC Small; compressed; squarish	9' 23:56.7 61°24'	9.4
○○ NGC7789	OC !! The White Rose; large; Cloud of 300 tiny ☆; very faint Beehive Cluster, M44-CNC.	18' 23:57.0 56°44'	6.7
○ NGC7790	OC ! 9000LY; thousands of ☆	17' 23:58.4 61°13'	8.5
○ NGC103	OC Elusive; somewhat compressed	5' 00:25.3 61°19'	9.8
○○ NGC129	OC Bright; scattered; 50☆	14' 00:29.9 60°14'	6.5
○ NGC133	OC Pretty large with ☆☆	7' 00:31.3 63°21'	9.4
○ NGC146	OC Pretty large; little comp; 50☆	7' 00:32.9 63°19'	9.1
○ NGC147	GC Elongated; faint; dwarf; ⊥	8.2' 00:33.2 48°30'	9.5
○ NGC185	EG E1; round; 2.2MLY; ⊥	12.5' 00:39.0 48°20'	10.5
○ NGC189	OC Pretty large; round	3.7' 00:39.6 61°05'	8.8
○ NGC225	OC Fine cluster; small letter "w"	12' 00:43.6 61°46'	7.0
○ NGC281	C/N !! PacMan/Heart Nebula; Large, dark nebula involved; use UHC filter.	30' 00:52.8 56°36'	7.2
○ NGC381	OC Pretty compressed; 40☆	6' 01:08.4 61°35'	9.3
○ NGC436	OC Small; irregularly faint; 40☆	6' 01:15.6 58°49'	8.8
○○ NGC457	OC ! Airplane/Owl Cluster; 80☆	13' 01:19.1 58°20'	6.4
○ NGC559	OC Bright; round; 50☆	4.4' 01:29.5 63°19'	9.3
○ NGC637	OC Small with 20 faint ☆	3.5' 01:43.1 63°42'	7.8
○ NGC654	OC Dense; 50☆; mag11-14	5' 01:44.0 61°53'	6.5
○ NGC659	OC Little rich, bright; 30 faint ☆	4' 01:44.4 60°40'	7.9
○○ NGC663	OC ! 80☆, several ☆☆	5' 01:46.0 61°15'	7.0
○○ NGC743	OC 20☆; compact; triangular	5' 01:58.5 60°10'	9.5
○ NGC1027	OC Rich; scattered; 12☆	20' 02:42.6 61°36'	6.7



- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ○ Galaxy

Circle = to mag 7. North is up.

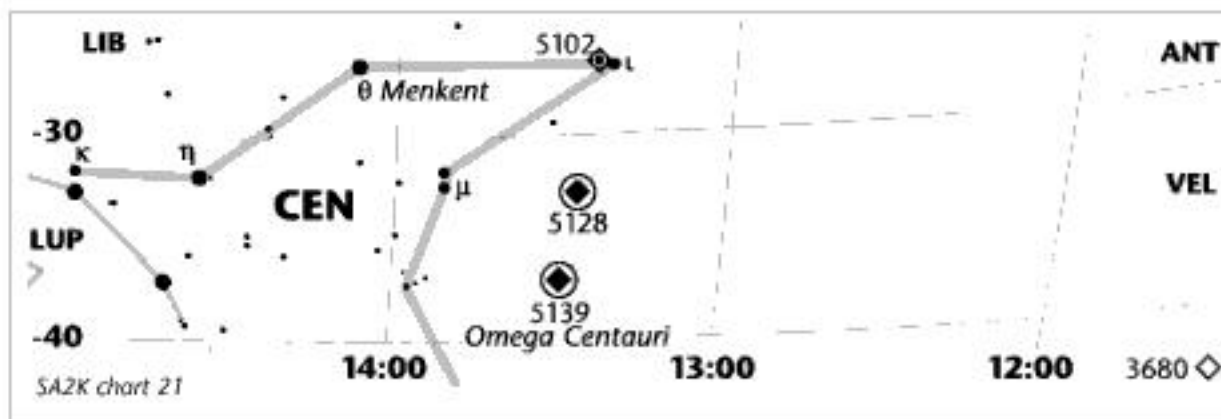
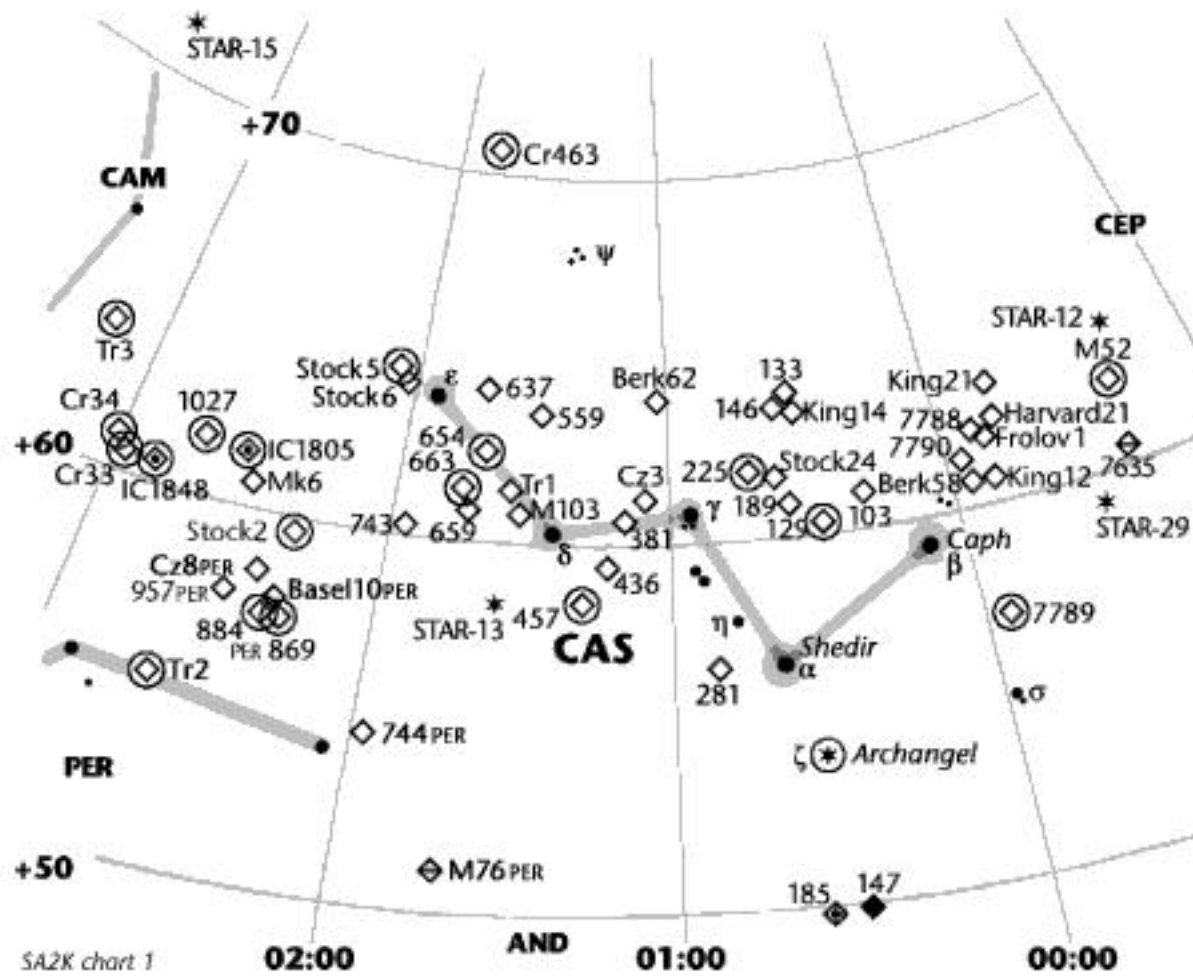
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Cassiopeia CONTINUED		Autumn Nov20	CAS
○ STAR-29	Ast <i>Lucky 7</i> asterism	70x125"	23:03.0 59°30' —
○ STAR-12	Ast <i>Airplane</i> asterism	60'	23:20.0 62°20' —
○ King21	OC 15 dim ☆; some ☆☆	2.5'	23:49.9 62°43' 9.8
○ King12	OC 12☆; bright ☆☆ involved	2'	23:53.0 61°58' 10.0
○ Har21	OC Very faint; nebulous	4'	23:54.1 61°46' 9.0
○ Frolov1	OC Right angle of ☆'s	—	23:57.4 61°38' 9.2
○ Berk58	OC Faint nebulous patch	8'	00:00.2 60°58' 9.7
○ King14	OC Quite rich in rich field; 29☆	7'	00:31.9 63°10' 8.5
○ <i>The Archangel</i>	Ast ζ-λ association; 60☆	—	00:35.0 55°00' 6.5
○ Stk24	OC Superb high power with 10"	4'	00:39.7 61°57' 8.8
○ Berk62	OC 2 chains of 17☆; SW-NE	10'	01:01.0 63°57' 9.3
○ Cz3	OC 10☆	3'	01:03.2 62°48' 9.9
○ Tr1/Cr15	OC 25☆; haze of unresolved ☆	4'	01:35.7 61°17' 8.1
○ STAR-13	Ast <i>Queen's Kite</i> asterism	220x160'	01:38.0 58°30' —
○○ Cr463	OC 40☆ in 36' field	36'	01:48.4 71°57' 5.7
○ Stk5	OC 17☆ at 100x; circlet shape	15'	02:04.5 64°26' 7.0
○○ Stk2	OC <i>The Musclemans Cluster</i> ; 88☆ at 100x; bright, rich; north of Double Cluster.	60'	02:11.0 59°02' 4.4
○ Stk6	OC Rich; scattered	20'	02:23.7 63°52' 10.0
○○ Mrk6	OC ~12☆; small group at 100x	4.5'	02:29.6 60°39' 7.1
○○ IC1805	C/N <i>Heart and Soul Nebulae</i> ; 39☆; 90'	02:32.7	61°27' 6.0 Scattered oval; compressed center; cluster Mel 15 involved.
○ IC1848	EN <i>The Embryo</i> ; diffuse; v fine	90x45'	02:50.0 60°25' 6.0
○ Cr33	OC 25☆; in the Head with Cr34	36'	05:59.3 60°24' 5.9
○ Cr34	OC Group near NGC1027	25'	03:00.9 60°25' 6.8
○○ Tr 3	OC 5-25☆ seen; loose trapezoid	23'	03:11.8 63°15' 7.0
○ STAR-15	Ast <i>Kemble's Kite</i> asterism	90x30'	03:28.0 72°00' —

Centaurus *Chiron, the Centaur* Spring May20 **CEN**

Quite low in the sky. Only brightest are listed.

☆☆ Alpha	α	Yellow/orange; 3rd brightest ☆	8.7"	14:39.7	-60°49'	-0.27
☆ Proxima		Closest at 4.22LY; "flare star," quickly variable;				10.7
		Diameter: 5% of our Sun.				
○ NGC3680	OC	Pretty rich; little compressed	6'	11:25.6	-43°15'	7.6
○ NGC5102	SG	S0; elongated; bright core	8x3'	13:22.0	-36°38'	9.6
○ NGC5128	IG	lrr; <i>Hamburger</i> ; impressive;	27x9'	13:25.5	-43°01'	6.8
		4.5° N of ω-CEN; Member of Centaurus Galaxy Group which includes M83-HYA, NGC4945, 5102 and 5253.				
○○ NGC5139	GC	!! <i>Omega Centaurus Cluster</i> ;	36'	13:26.8	-47°29'	3.7
		Finest GC in the sky; largest cluster seen from Earth.				



- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ● Galaxy

Circle = to mag 7. North is up.

CAS CEN 53

Objects in the Heavens

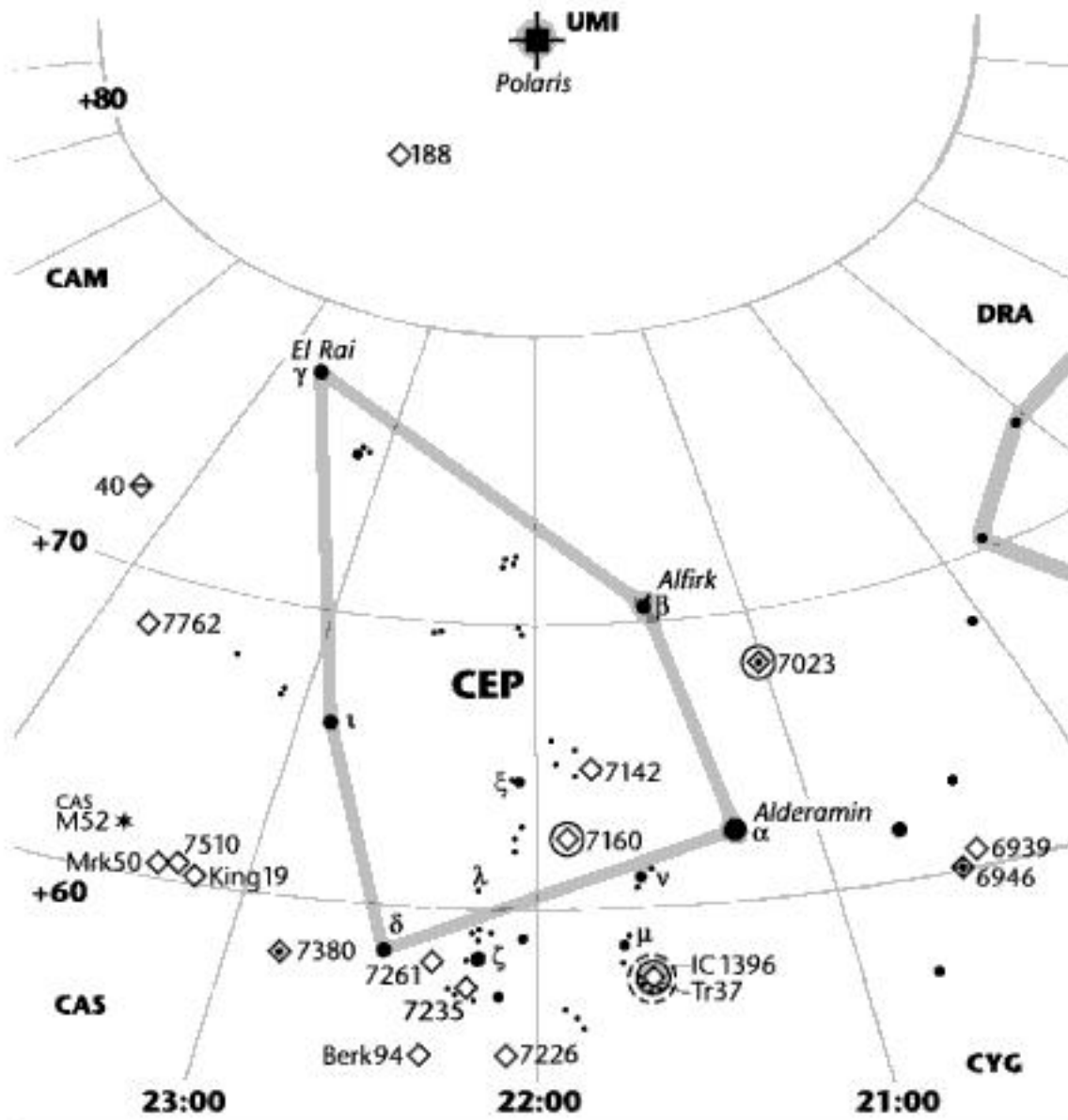
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Cepheus	<i>The King of Ethiopia</i>	Autumn Oct15	CEP
<i>"Splendid sweeps and curious groups between (alpha) and the Galaxy."</i>			
☆☆ <i>Alfirk</i>	β White/blue	13.3"	21:28.7 70°34' 3/8
☆☆ <i>Delta</i>	δ Yellow/blue; cepheid variable	191"	22:29.2 58°25' 4/6.3
☆ <i>Erakis</i>	μ <i>Herschel's Garnet Star</i> ; red SG; Larger than Saturn's orbit, one of the largest stars known.		21:43.5 58°47' 3.8-5
☆☆ <i>Kurhah</i>	ξ Yellow white/blue gray	7.7"	22:03.8 64°38' 4/6.5
☆☆ Σ2816	☆☆☆; in IC1396	11.7"/20"	21:39.0 57°29' 5-8
○ NGC6939	OC 80☆; very rich	8'	20:31.4 60°38' 7.8
○ NGC6946	SG Sc; <i>The Fireworks Galaxy</i> ; rich; Most supernovae; close spiral @ 10MLY; 20,000LY across.	11'	20:35.4 60°07' 8.8
○ NGC7023	C/N <i>Iris Nebula</i> ; neb with mag 7☆	5'	21:00.5 68°10' 7.0
○ NGC7142	OC 50☆; large; very rich; Dim cluster NGC7129 (mag11) and nebula 7133 in field.	4.3'	21:45.2 65°46' 9.3
○○ NGC7160	OC Sparse; scattered	7'	21:53.7 62°36' 6.1
○ NGC7226	OC 5-6☆; very faint; elliptical	1.8'	22:10.5 55°25' 9.6
○○ NGC7235	OC ! Contains Ruby ☆	4'	22:12.6 57°17' 7.7
○ NGC7261	OC Large; pretty rich; little comp	6'	22:20.4 58°05' 8.4
○ NGC7380	C/N 20☆; large; rich	12'	22:47.3 58°08' 7.2
○ NGC7510	OC Rich; fan-shaped; compressed	4'	23:11.5 60°34' 7.9
○ NGC7762	OC 11☆ mag11-15; pretty rich	11'	23:49.8 68°02' 10.0
○ NGC40	PN <i>Bow Tie Neb</i> ; round; greenish	37"	00:13.0 72°32' 10.1
○ NGC188	OC 150☆; round; 4° from Polaris	14'	00:47.5 85°14' 8.1
○ IC1396	C/N <i>The Elephant Trunk Nebula</i> ; Classic stellar nursery; contains μ-CEP; use filter.	89'	21:39.1 57°30' 3.2
○ Tr37	OC 30☆; involved with IC1396	50'	21:39.0 57°30' 5.1
○ Berk94	OC 10☆ around mag10☆	4'	22:22.7 55°51' 8.7
○ King19	OC 20☆; near NGC7510	7'	23:08.3 60°31' 9.2
○ Mrk50	OC 13☆ in 3°; very compressed	5'	23:15.3 60°28' 8.5

Cetus *the Sea Monster, the Whale* Autumn Nov30 **CET**

"Fine combinations and doubles; many dim."

☆ <i>Mira</i>	ο <i>Wonderful Star</i> ; 332 day variable	02:19.3	-02°59' 2-10
☆☆ <i>Kaffaljidhina</i>	γ Yellow/white/redish dwarf	2.8"	02:43.3 03°14' 3.5/7
○ M77 1068	SG Sb; intense core; Cetus-A; <i>Seyfert Galaxy</i> ; 60MLY; NGC1055 (mag10.5) in field NW.	7'	02:42.7 -00°01' 8.9
○ NGC157	SG Sc; bright core; 2☆ inside	3x2'	00:34.8 -08°24' 8.5
○ NGC246	PN <i>Skull/Pac-Man Nebula</i> ; use OIII	4'	00:47.0 -11°53' 8.5
○ NGC247	SG Sc; poorly defined; long	21x7'	00:47.1 -20°46' 8.9
○ NGC936	SG SBa; dim NGC941 in field	5x4.4'	02:27.6 -01°09' 10.1
○ IC1613	IG Irr; 12,000LY diam; L	20x18'	01:05.1 02°08' 9.2

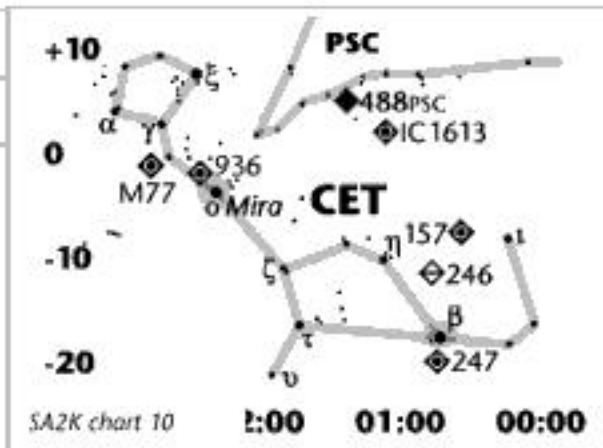
Galaxy designations, p.18 L – Member of Local Group



SAZK chart 3

- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ⊕ Cluster w/Nebulosity
- ◇ ⊕ Nebula
- ◆ ⊕ Galaxy

Circle = to mag 7. North is up.

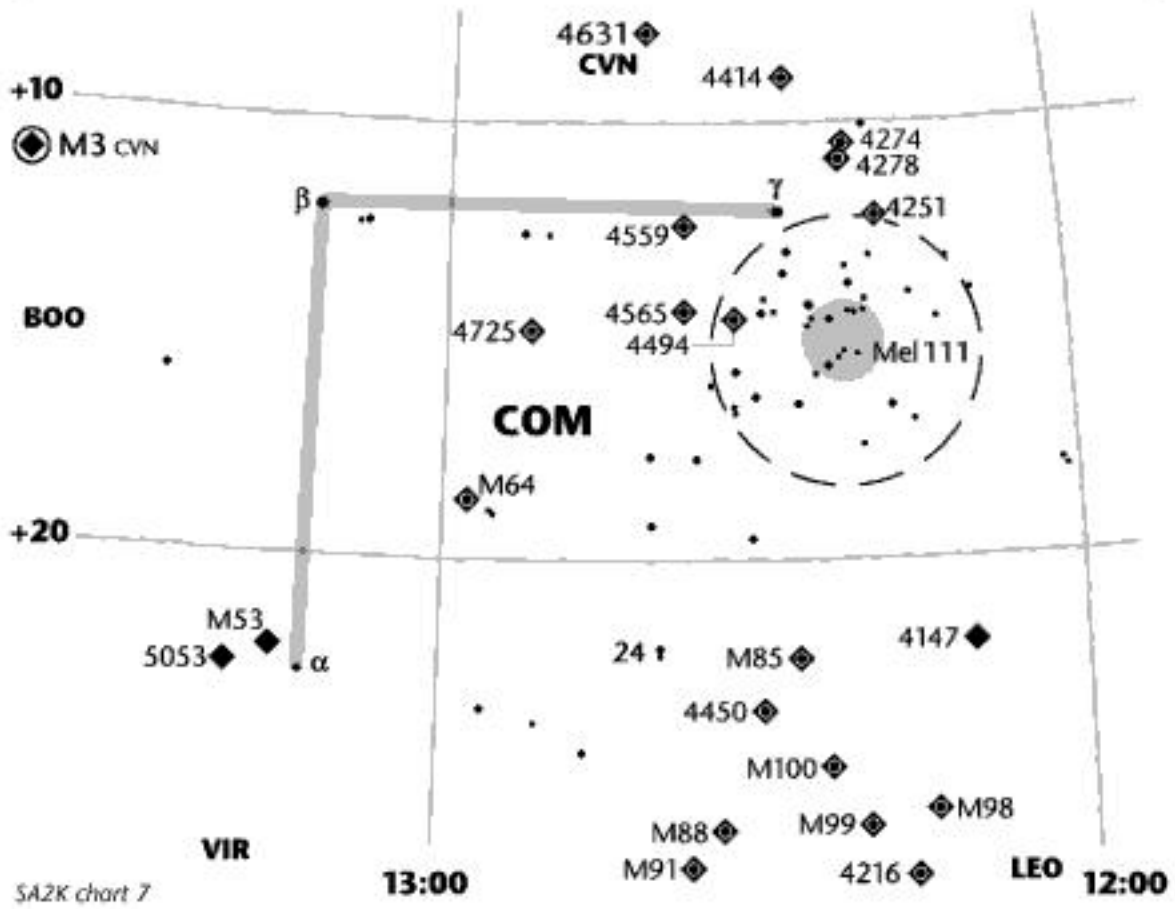
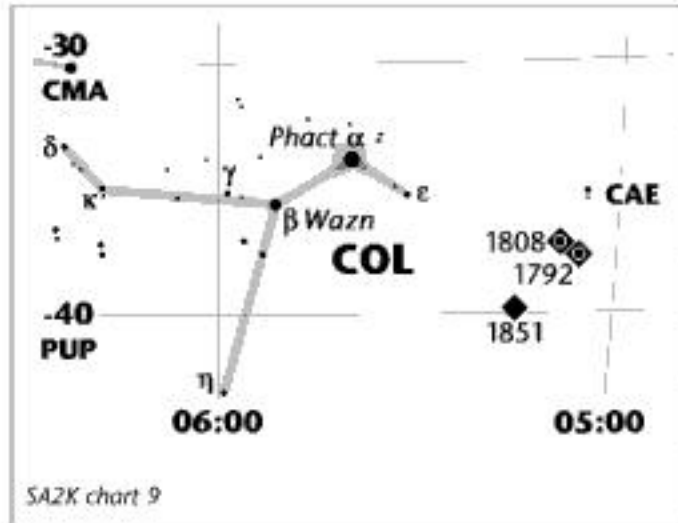


SAZK chart 10

CEP CET 55

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Columba	<i>the Dove (Noah's Ark)</i>	Winter Jan30	COL
☆☆ <i>Phaet</i>	α Variable; 268LY	12" 05:39.6 -34°04'	2.6/12
○ NGC1792	SG Sc; extended; resolvable	5.5x2.5' 05:02.2 -37°59'	9.9
○ NGC1808	SG SB; elongated; bright core	6x4' 05:07.7 -37°31'	9.9
○ NGC1851	GC Loose; round; bright middle	11' 05:14.1 -40°03'	7.2
Coma Berenices	<i>Berenice's Hair</i>	Spring May15	COM
<i>"A gathering of stars which obviously requires distance only to become a nebula to the naked eye. Sweeping poor, except nebulae."</i>			
☆☆ 24	<i>Spring Alberio</i> ; dim SG nearby	20.3" 12:35.1 18°23'	5/6.7
○○ M53 ₅₀₂₄	GC Brilliant, bright core, spokes; 60,000LY; 1° NE of α-COM, NGC 5053 1° to north.	14.4' 13:12.9 18°10'	7.5
○○ M64 ₄₈₂₆	SG Sa; <i>Black Eye Galaxy</i> ; smooth; "Magnificent large bright nebula blazing to a nucleus." Look for dark patch NE of core; 17MLY.	10x5' 12:56.7 21°41'	8.5
○ M85 ₄₃₈₂	SG Ep/S0; lenticular; Bright core; NGC 4394 (mag10.9) in field to NE.	7x5' 12:25.4 18°11'	9.1
M88-M100 in large group with others in Virgo.			
○ M88 ₄₅₀₁	SG ! Sb; elongated; bright core; Best of the VIR-COM Group for small scopes.	6x3' 12:32.0 14°25'	9.7
○ M91 ₄₅₄₈	SG SBb; comet? very faint; long	5x4' 12:35.4 14°30'	9.5
○ M98 ₄₁₉₂	SG Sb; elongated; bright core; One of Messier's errors; faint.	10x3' 12:13.8 14°54'	10.1
○ M99 ₄₂₅₄	SG Sc; <i>Pinwheel Galaxy</i> ; difficult	5x5' 12:18.8 14°25'	9.8
○ M100 ₄₃₂₁	SG Sc; round "glow"; face-on; Largest in VIR-COM Group; NGC 4312 (m11.7) in field to SW.	7x6' 12:22.9 15°49'	9.3
○ NGC4147	GC Small; starlike outer nebulosity	4' 12:10.1 18°33'	9.6
○ NGC4251	SG Sa; round; starlike nebulosity	4x2' 12:18.1 28°10'	10.0
○ NGC4274	SG Sb; NGC4278/83/86 in field	7x3' 12:19.8 29°37'	10.4
○ NGC4278	EG E1; in chain with NGC4283/86	4' 12:20.1 29°17'	10.0
○ NGC4414	SG Sc; ext. arms, starlike hub	3.6x2' 12:26.4 31°13'	9.9
○ NGC4450	SG Sb; round; distinct nucleus	5x4' 12:28.5 17°05'	10.0
○ NGC4494	EG E1; bright; round	4.5x4.3' 12:31.4 25°46'	9.8
○ NGC4559	SG Sc; very bright; edge-on; coarse	11x5' 12:36.0 27°58'	9.8
○ NGC4565	SG !! Sb; <i>Needle Galaxy</i> ; <i>Berenice's Hairclip</i> ; edge-on; 25MLY; Milky Way-sized.	14x2' 12:36.3 25°59'	9.6
○ NGC4725	SG SBb; elongated; bright core	11x8' 12:50.4 25°30'	9.2
○ NGC5053	GC 1° SE of M53; dim	10.5' 13:16.5 17°42'	9.6
○○ Mel111	OC <i>Coma Star Cluster</i> ; 30☆☆; 3rd closest cluster at 250LY; Named for the Queen of Ptolemy III (246-221BC).	275'(4.5°) 12:25.1 26°06'	1.8



- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ⊕ Cluster w/Nebulosity
- ◇ ⊕ Nebula
- ◆ ⊕ Galaxy

Circle = to mag 7. North is up.

Objects in the Heavens

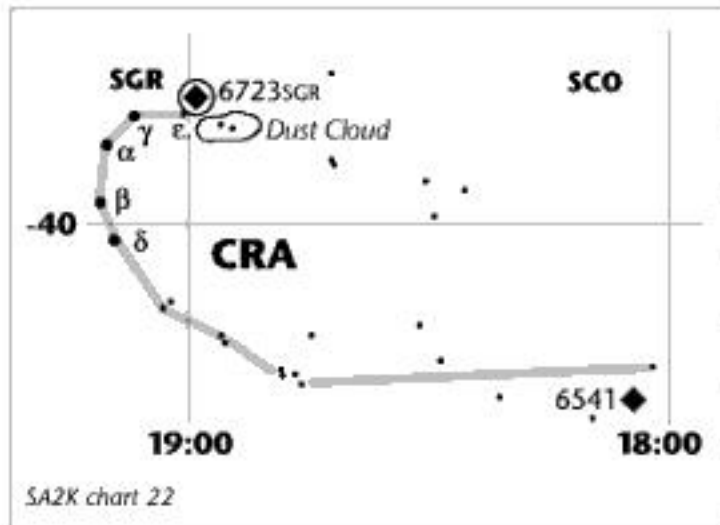
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Corona Australis	<i>Southern Crown</i>	Summer Aug15	CRA
○○ NGC6541 GC	Very compressed; 400☆; Well resolved; located 20' SE of a mag5☆.	13' 18:08.0 -43°42'	6.1
○ Dust Cloud	Contains 2 blue ☆; NGC6726, 6727, 6729, IC4812 are involved.	19:00.0 -37°00'	—

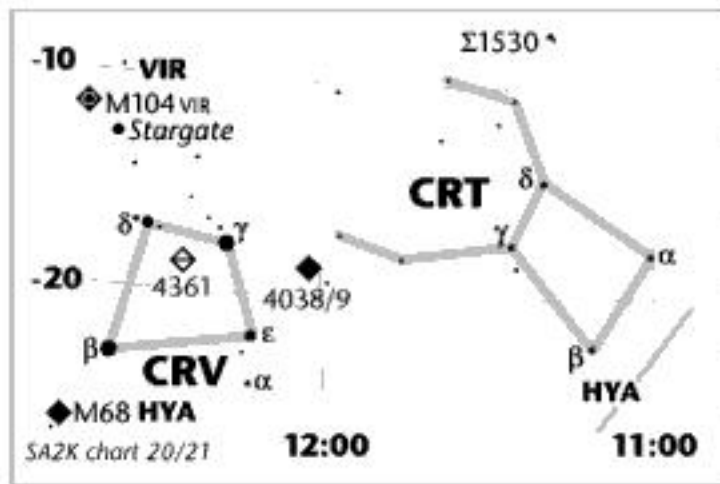
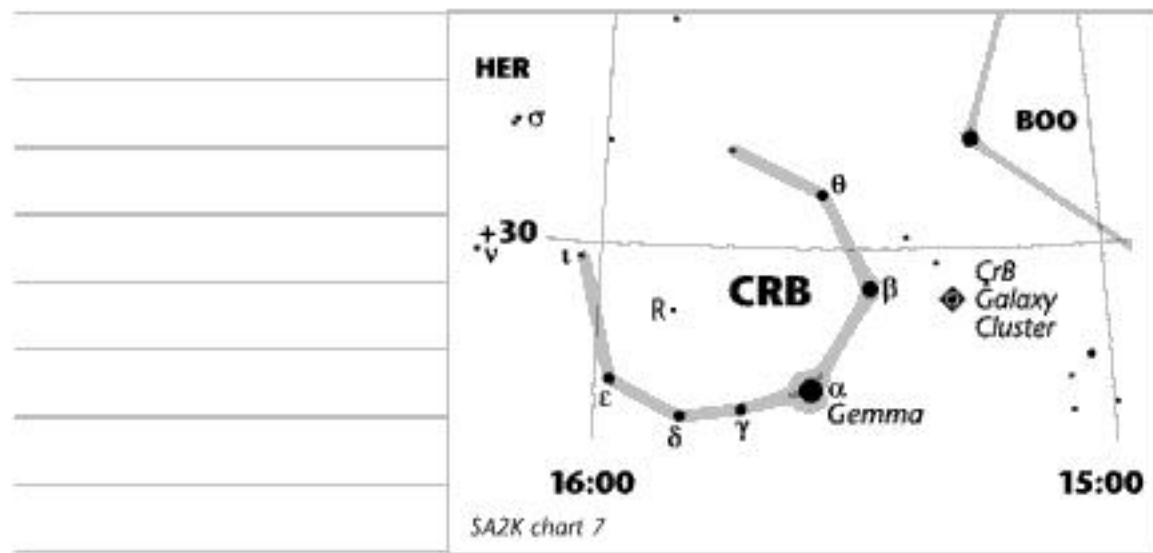
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Corona Borealis	<i>Northern Crown</i>	Summer Jun30	CRB
<i>"A constellation resembling more than usual the object whose name it bears."</i>			
☆ Gemma α	Brightest in crown; 75LY	15:34.7 26°43'	2.3
☆☆ Zeta ζ	Greenish-white/green	6.3" 15:39.4 36°38'	5/6
☆☆ Sigma σ	2 solar-looking dwarfs; 71LY	6.2" 16:14.7 33°52'	5.6/7
☆ R	Binoc-variable; type RCB (AAVSO)	15:44.0 28°00'	6-15
--- CRB Galaxy Cluster:	400 galaxies	30' 15:20.5 27°50'	16

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Corvus	<i>the Crow</i>	Spring May10	CRV
<i>"This small constellation contains several conspicuous stars."</i>			
☆☆ Algorab δ	Yellow/lilac; fine contrast	24.2" 12:29.9 -16°31'	3/9.2
○ NGC4038/9 SG	S?/p; Ring Tail Galaxy	5x3' 12:01.9 -18°52'	10.4
○ NGC4361 GC	Small; bright; mag13☆ inside	45" 12:24.5 -18°48'	10.3
○ STAR-20 Ast	Stargate Ast.; near M104-VIR	15' 12:35.7 -12°02'	—

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Crater	<i>the Cup</i>	Spring Apr25	CRT
<i>"Like Corvus, an appendage of Hydra."</i>			
☆☆ Σ1530	Pale yellow/pale blue; binocs	8" 11:14.0 -07°00'	7/8.2
(Numerous other faint objects, ☆☆ and variables)			





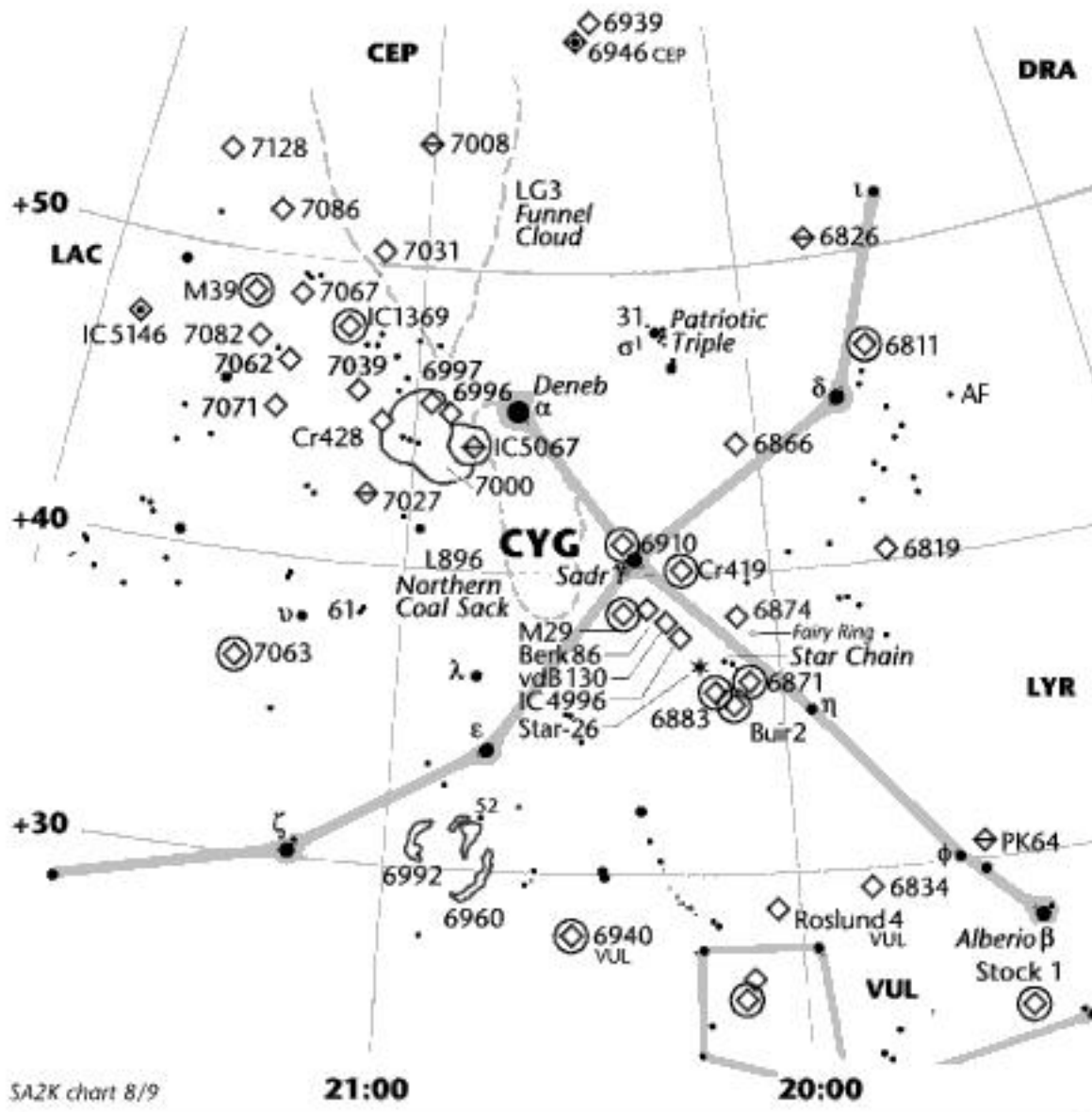


- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ⊕ Cluster w/Nebulosity
 - ◇ ⊕ Nebula
 - ◆ ⊕ Galaxy
- Circle = to mag 7. North is up.

CRA CRB CRV CRT 59

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Cygnus	<i>the Swan, Northern Cross</i>	Summer Sep1	CYG
<i>"This fine cruciform occupies a prominent position in the Galaxy, and its low-powered fields are overpowering in magnificence."</i>			
☆ Deneb	α 19th brightest; a "fixed star"; One of greatest Super Giants, rivaled only by Rigel.	20:41.4 45°17'	1.3
☆☆ Alberio	β ! Super-fine gold/blue	34.4" 19:30.7 27°58'	3/5
☆ Sadr	γ <i>The Swan's Breast</i> ; center of cross	20:22.2 40°15'	2.2
☆☆ 31	σ ² ! <i>Patriotic Triple</i> 107"/337"	20:13.6 46°44'	4/5/7
☆☆ 61	Both orange tint dwarfs	28" 21:06.9 38°45'	5.2/6
☆ AF	Binoc variable, 93 days	19:27.0 45°00'	6.2/8
○○ M29 ⁶⁹¹³	OC <i>Cooling Tower Cluster</i> ; 20☆; Trapezoid-shaped; weak; scattered.	7' 20:23.9 38°32'	6.8
○○ M39 ⁷⁰⁹²	OC Large, loose cluster; 25☆	32' 21:32.2 48°26'	4.8
○ NGC6811	OC Dense; pretty rich; 50☆	15' 19:38.2 46°34'	6.8
○○ NGC6819	OC <i>Fox Head Cluster</i> ; Rich; 150☆ mag11-15; faint.	6' 19:41.3 40°11'	7.3
○ NGC6826	PN !! <i>Blinking Planetary</i> ; lt. blue	27" 19:44.8 50°31'	9.5
○ NGC6834	OC Sparse; little compressed	5' 19:52.2 29°24'	7.8
○ NGC6866	OC Very large; rich; 50☆	8' 20:03.9 44°10'	7.6
○ NGC6871	OC Rich; some ☆☆	20' 20:05.9 35°47'	5.2
○ NGC6874	OC 15 stars within 7'	14' 20:07.8 38°14'	7.7
○ NGC6883	OC Open cluster with nebula	15' 20:11.3 35°51'	6.5
○○ NGC6910	OC <i>Rocking Horse Cluster</i> ; 40☆	8' 20:23.2 40°47'	7.0
○ NGC6960	EN <i>The Witch's Broom - West</i> ; 210x6' 6992 - East Veil; use filter; ☆☆ 52-CYG involved (6' sep.)	20:45.7 30°43'	7.2
○ NGC6996	OC Half-circle of 20☆ mag10-12	7' 20:56.5 45°29'	10.0
○ NGC6997	OC Large, scattered; west in 7000	7' 20:56.8 44°39'	10.0
○○ NGC7000	EN <i>North American Nebula</i> ; 120x9' 50LY wide; use low power and nebula filter.	21:58.8 44°20'	5.0
○ NGC7008	PN Patchy oval ring 98x75"	21:00.6 54°33'	10.0
○ NGC7027	PN? Proto-planetary; unique; <i>Richest spectrum of all the planetaries.</i>	18x10" 21:07.0 42°14'	10.0
○ NGC7031	OC Small; poor; 14☆	5' 21:07.3 50°50'	9.1
○ NGC7039	OC Large; rich; extended	25' 21:11.2 45°39'	7.6
○ NGC7062	OC Small; pretty rich/compressed	7' 21:23.5 46°23'	8.3
○○ NGC7063	OC Sparse; ☆ mag10 and fainter	8' 21:24.4 36°30'	7.0
○ NGC7067	OC Involved with M39	3' 21:24.2 48°01'	9.7
○ NGC7071	OC 15☆; elliptical; 1° from M39	4' 21:26.5 47°57'	10.0
○ NGC7082	OC Large; pretty rich/compressed	25' 21:29.4 47°05'	7.2
○ NGC7086	OC Very rich; pretty compressed	9' 21:30.5 51°36'	8.4
○ NGC7128	OC Small; pretty rich; 30☆	3' 21:44.0 53°43'	9.7



- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ⊕ Cluster w/Nebulosity
- ◇ ⊕ Nebula
- ◆ ⊕ Galaxy

Circle = to mag 7. North is up.

CYG 61

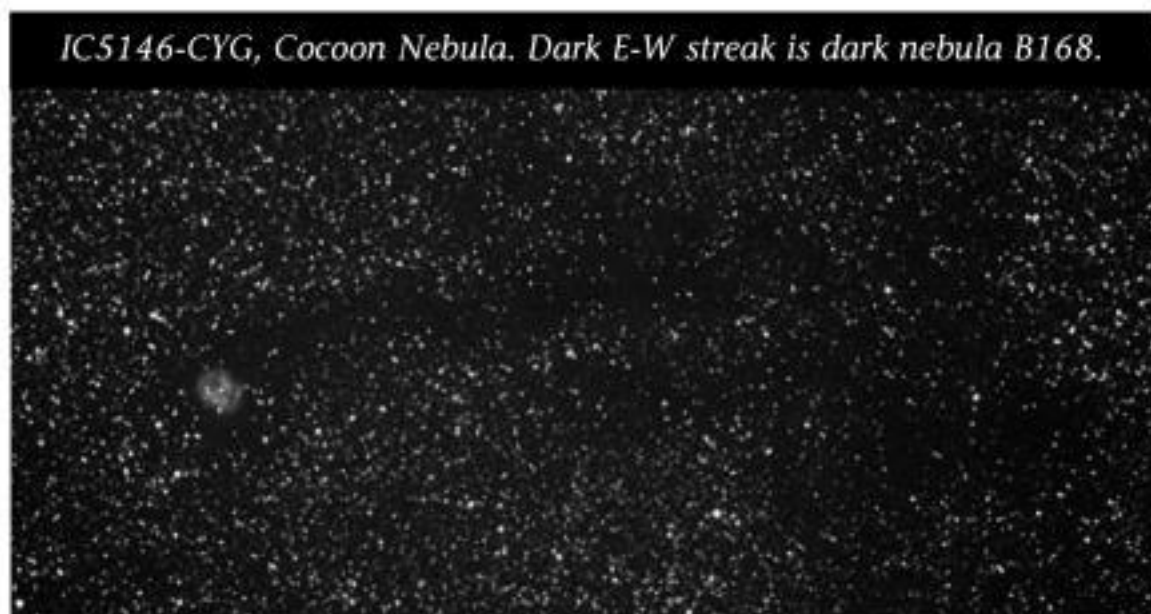
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Cygnus	CONTINUED	Summer Sep1	CYG
○ PK64+5.1PN	Campbell's H Star; nebulous	5" 19:34.8 30°31'	9.6
○○ Star Chain	Ast	3° 20:08.0 36°30'	—
○ Buir2	OC Near NGC6871/6883	13' 20:09.2 35°29'	6.3
○ STAR-26	Ast <i>Red Necked Emu</i>	45' 20:13.8 36°30'	—
○ IC4996	OC Mag8-13 ☆	6' 20:16.5 37°38'	7.3
○ vdB130	OC Grouping near M29	6' 20:17.7 39°20'	9.3
○ Cr419	OC Compact, not rich; 14☆	4.5' 20:18.1 40°43'	5.4
○ Berk86	OC 20☆; almost triangular	8' 20:20.4 38°42'	7.9
○ IC5067	EN <i>Pelican Nebula</i> ; bright;	60x9' 20:47.8 44°22'	8.0
○ Cr428	OC 20☆; slight concentration	14' 21:03.2 44°35'	8.7
○ IC1369	OC Small cluster; mag13 ☆	2' 21:12.1 47°44'	7.0
○ IC5146	C/N <i>Cocoon Nebula</i> ; hazy	20x9' 21:53.4 47°16'	9.5
○ L896	DN <i>Northern Coal Sack</i> , cosmic dust through α, β, λ;	—	—
○ LG3	DN <i>Funnel Cloud Nebula</i> ;	12° 21:00.0 53°00'	—
Dark area north of Deneb, flowing to Cepheus.			

Delphinus *the Dolphin, Porpoise* Autumn Sep15 **DEL**

"The leaders of this little constellation are distinguished by names which, even among the multifarious disfigurements of Oriental words, so abundant in the heavens, are pre-eminently strange – Svalocin and Rotanev." (read backwards)

☆☆ Sualocin	α Yellow/blue-green	69" 20:39.6 15°55'	5/11
☆☆ Gamma	γ Lemon+lime; 100LY	9.6" 20:46.7 16°07'	4.5/5.5
○ NGC6891	PN Small; well resolved	15x7" 20:15.1 07°14'	10.0
○○ NGC6934	GC Bright; compact globular	2' 20:34.2 07°24'	8.8
○ STAR-27	Ast <i>Dolphin's Diamonds</i>	15' 21:07.3 16°20'	—



Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION		
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG		
Draco	<i>the Dragon</i>	Spring to Autumn Jun20	DRA		
<i>"A long, winding constellation, always above the horizon; many fine pairs."</i>					
☆ Thuban α	Was North Star 4800 years ago	14:04.4 64°22'	3.6		
☆☆ Rastaban β	β+v = <i>Dragon's Eyes</i>	4" 17:30.4 52°18'	3/11		
☆☆ As Rakis μ	Both white	2" 17:05.3 54°28'	6/6		
☆☆ Kuma ν	Both pale yellow; 100LY	62" 17:32.2 55°11'	5/5		
☆☆ Psi ψ	Easy pair	30.3" 17:41.9 72°09'	5/6		
☆☆ 16/17	☆☆☆; wide pair white	3.4"/90" 16:36.2 54°28'	5/5/6		
☆☆ 40/41	Beautiful pair	19.3" 18:00.2 80°00'	6/6		
○ M102 ⁵⁸⁶⁶ EG	E6p; <i>Spindle Galaxy</i> ; 40 _M LY; Large; pretty bright; (many ? object's type), near NGC 5907.	5x2' 15:06.5 55°46'	9.9		
○ NGC4125 SG	E5/S0; Edge-on; bright core	5x3' 12:08.1 65°10'	9.7		
○ NGC4236 SG	Sb; very elongated	22.5x6' 12:16.7 69°28'	9.6		
○ NGC6503 EG	Sb; bright; elongated; smooth	6x2' 17:49.4 70°09'	10.2		
○ NGC6543 PN	<i>Cat's Eye Nebula</i> ; bluish disk; First of its kind to be spectroscopically analyzed.	20" 17:58.6 66°38'	8.5		
○ O'Niell's Cluster	Variable ☆ Kappa involved	___ 12:33.5 69°47'	3-5		
○ UGC10822 EG	Dwarf; 500LY across; L	33x10' 17:20.2 57°55'	9.9		
○ STAR-25 Ast	<i>Little Queen</i> asterism	10x20' 18:35.0 72°25'	___		
Galaxy designations, p.18 L – Member of Local Group					

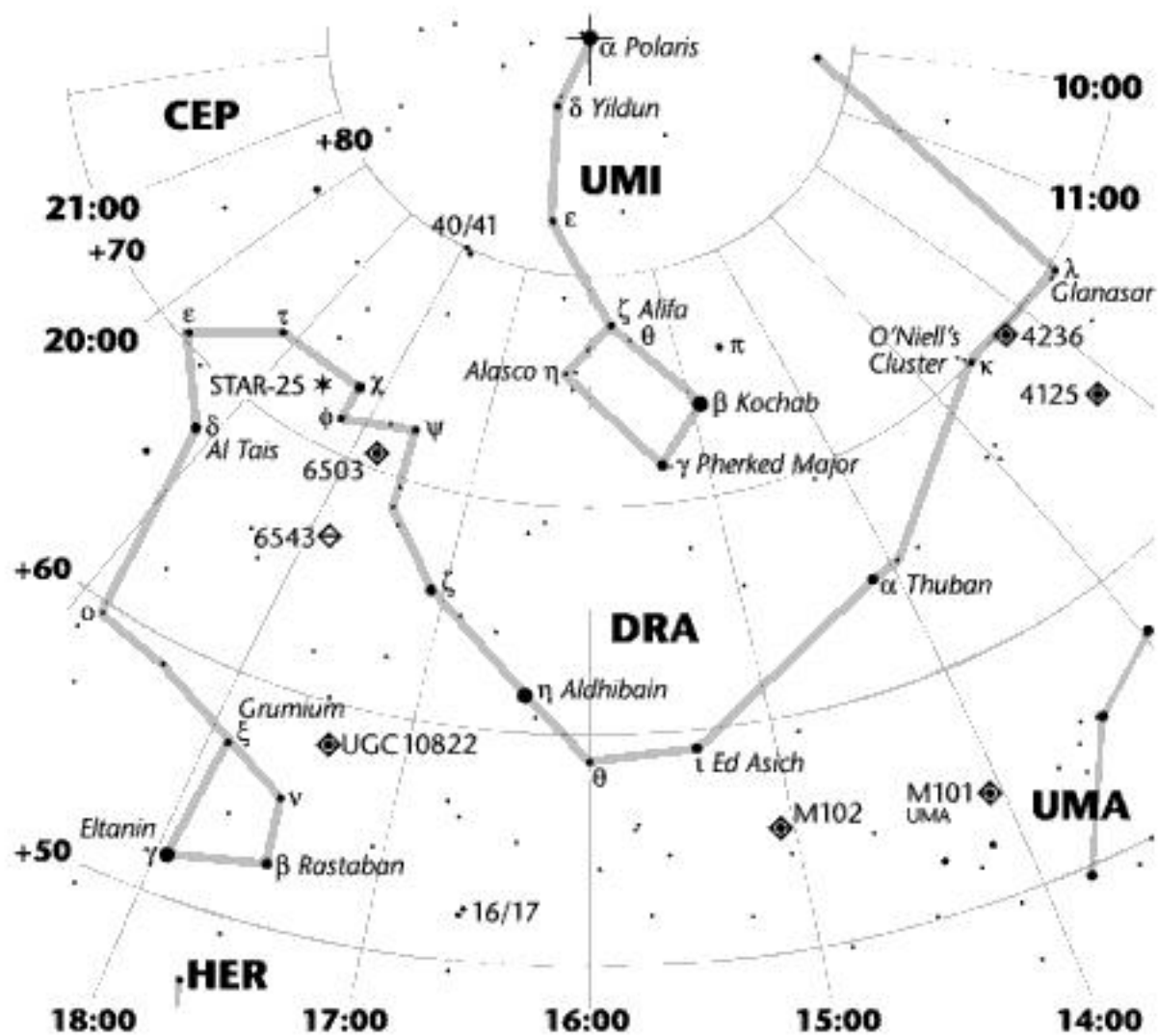
Equuleus *the Little Horse* Autumn Sep20 **EQU**

"This little asterism is easily recognised by the clustering of its stars, and its bearing from Pegasus. There are some good objects and many interesting low-power fields."

☆☆ Epsilon ε White/blue; 140LY 11" 20:59.1 04°18' 6/7

M102-DRA





SA2K chart 2/3



SA2K chart 16/17

- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ● Galaxy

Circle = to mag 7. North is up.

DRA EQU 65

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Gemini	<i>Twin Sons of Leda + Zeus</i>	Winter Feb20	GEM
<i>"Requires a little attention to the map to make out the whole constellation."</i>			
☆☆ Castor	α The Horseman; 51LY; Both greenish-white; 6☆ system.	3.8" 07:34.6 31°53'	2.5/8
☆ Pollux	β Golden tinted; 35LY	07:45.3 28°02'	1.14
☆☆ Wasat	δ Yellow/magenta; 28LY	6.8" 07:20.1 21°59'	3.5/8
☆☆ 38	Yellow/blue; good contrast	7' 06:54.6 13°11'	5/8
○○ M35 ²¹⁶⁸	OC ! must see; rich; compressed; <i>"Beautiful and extensive region of small stars, a nebula to the naked eye."</i> Compare to M37-AUR; 300☆ mag8+; 2,800LY.	25' 06:08.9 24°20'	5.2
○ NGC2129	OC Rich; 50☆ mag8-15	7' 06:00.7 23°19'	6.7
○ NGC2158	OC Compact; 2° SW of M35; 973☆ on outer rim of Milky Way; 16,000LY.	5' 06:07.4 24°06'	8.6
○ NGC2266	OC Faint but rich	7' 06:43.3 26°58'	9.5
○ NGC2304	OC Small; 13☆ in oval; 60☆	5' 06:55.0 18°01'	10.0
○ NGC2331	OC Sparse; with small cluster	18' 07:07.0 27°16'	8.5
○ NGC2355	OC S-shaped, loose	9' 07:16.9 13°47'	9.7
○ NGC2356	OC 9☆; mag11 brightest	9' 07:17.0 13°45'	9.7
○ NGC2372	PN Peanut Neb.; 2371 nearby 47x42'	07:25.6 29°30'	9.5
○ NGC2392	PN !! Eskimo (Clown Face) Nebula; 13" First observed as a mag9 ☆, "With a pretty bright nebulosity, equally dispersed all around; a very remarkable phenomenon."	07:29.2 20°55'	8.5
○ NGC2395	OC Faint; elusive; rich; scattered	12' 07:27.2 13°37'	8.0
○ NGC2420	OC Rich; compressed	10' 07:38.4 21°34'	8.3
○ IC2157	OC Small angular size; near M35	7' 06:04.8 24°04'	8.4
○ Cr89	OC 15☆; 4,240LY	48' 06:18.0 23°38'	5.7
○ Boc1	OC Loose; scattered	3.4' 06:25.5 19°46'	7.9



Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG

Hercules *Hercules, son of Zeus* Summer Jul25 **HER**

"Some very noteworthy telescopic objects mark this constellation; and there is very fine sweeping in its south-following portion."

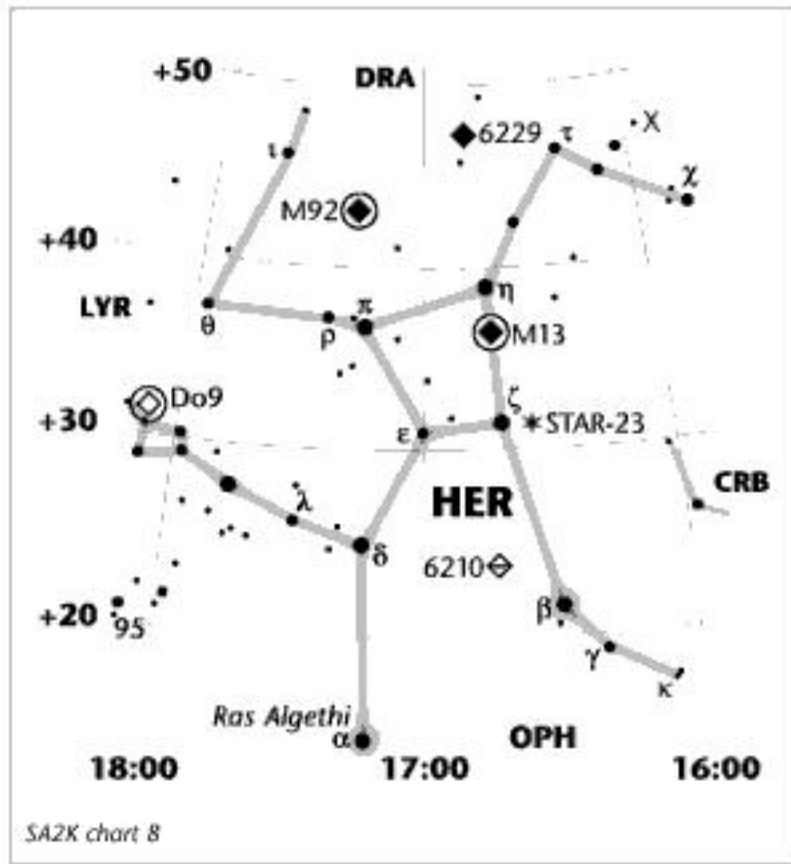
☆☆ RasAlgethi	α	Red/green (yellow/blue?)	4.7"	17:14.6	14°23'	3.5/5
☆☆ Sarin	δ	Green/pale purple	8.9"	17:15.0	24°30'	3/8
☆☆ Marfik	κ	Yellow/orange-red	28"	16:08.1	17°03'	5/6.5
☆☆ Rho	ρ	Both white	4.1"	17:23.7	37°09'	5/5.6
☆☆ 95		Cherry red/apple green	6.3"	18:01.5	21°36'	5/5
☆ X		Binoc variable, 95 days, semi-reg.		15:59.0	47°00'	7.5-8.6
○○M13 ₆₂₀₅	GC	!! Great Cluster; 100,000☆☆; 23,000LY away; 125LY diameter; star chains at margins. Density: ~1☆/cubic-LY. If each star were a grain of sand @ .035" diam, distance between stars would seem 3 miles. Galaxy NGC6207 (mag11.6) in field to NE.	23'	16:41.7	36°28'	5.7
○○M92 ₆₃₄₁	GC	Bright; spiral structure; nice	11.2'	17:17.1	43°08'	6.3
○ NGC6210	PN	Small; bluish disc; bright	16'	16:44.5	23°49'	9.1
○ NGC6229	GC	Mottled triangle; very bright	4'	16:47.0	47°32'	9.4
○ STAR-23	Ast	Backwards 5	20'	16:37.8	31°05'	—
○ DoDz9	OC	25☆☆ in 20' ring	20'	18:08.9	31°32'	6.5

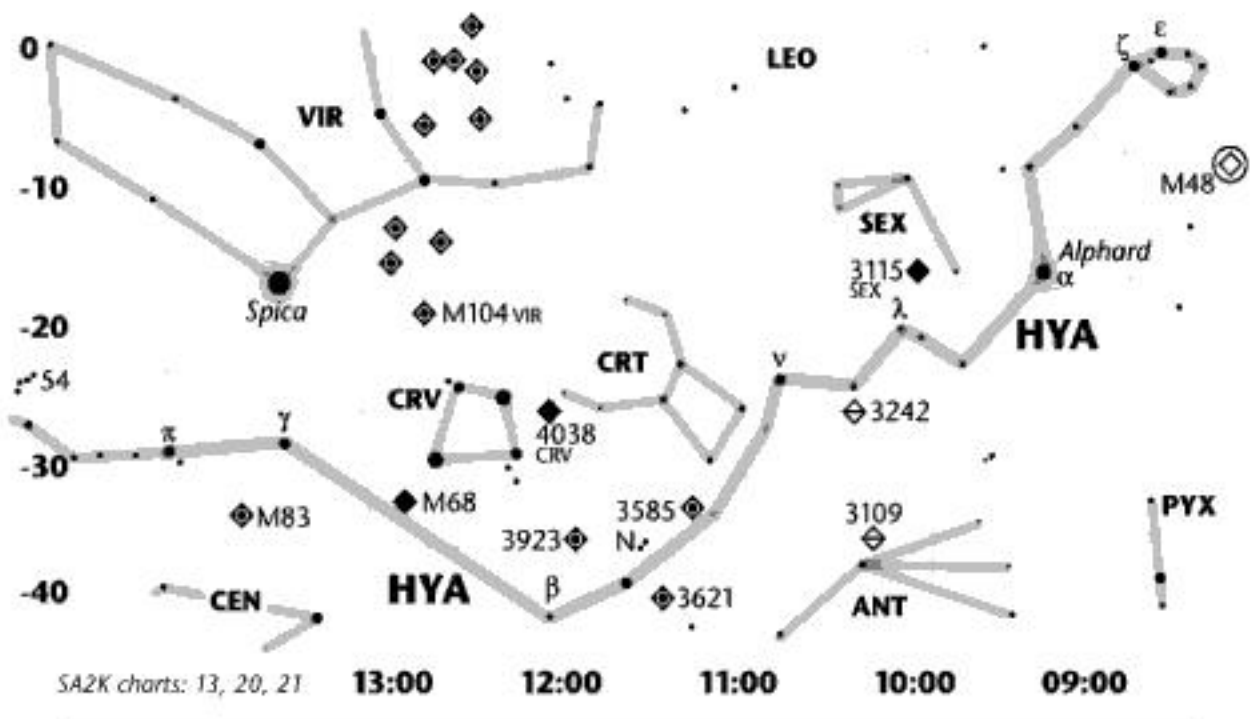
Hydra *the Water Snake (Female)* Spring Apr20 **HYA**

"A very lengthy and not very interesting constellation to the unaided eye, but containing some telescopic work."

☆☆ Epsilon	ε	Yellow/blue; 135LY	4"	08:46.8	-06°25'	3.7/8
☆ Nu	ν	Reddest ☆ known; variable		10:51.6	-21°20'	6-8.5
☆ Upsilon	υ	Very red in nice field; irregular		10:37.6	-13°24'	4.7-6
☆☆ 54		Red/blue	9"	14:45.1	-25°26'	5/7
☆☆ N		Equal magnitude pair	9.2"	11:32.3	-29°16'	6/6
○ M48 ₂₅₄₈	OC	Rich; large; sparse; 50☆☆	54'	08:13.8	-05°48'	5.5
○ M68 ₄₅₉₀	GC	Irregular; round; 32,000LY	10'	12:39.5	-26°45'	7.9
○○M83 ₅₂₃₆	SG	Sc; Southern Pinwheel; face-on	13x10'	13:37.0	-29°52'	7.5
○ NGC3109	PN	Dull cloud in ancient Felix	19x4'	10:03.1	-26°10'	9.9
○ NGC3242	PN	!! Ghost of Jupiter/CBS Eye; Oval, pale blue ring; broad faint nebulosity around.	16"	10:24.8	-18°38'	8.0
○ NGC3585	EG	E5/E6; bright	5x3'	11:13.3	-26°45'	9.9
○ NGC3621	SG	Sc/Sd; Frame Galaxy; 4☆☆ circle	12x7'	11:18.3	-32°49'	9.6
○ NGC3923	SG	E4; Bright; pretty extended	6x4'	11:51.0	-28°48'	9.8

Galaxy designations, p.18 L – Member of Local Group





SA2K charts: 13, 20, 21

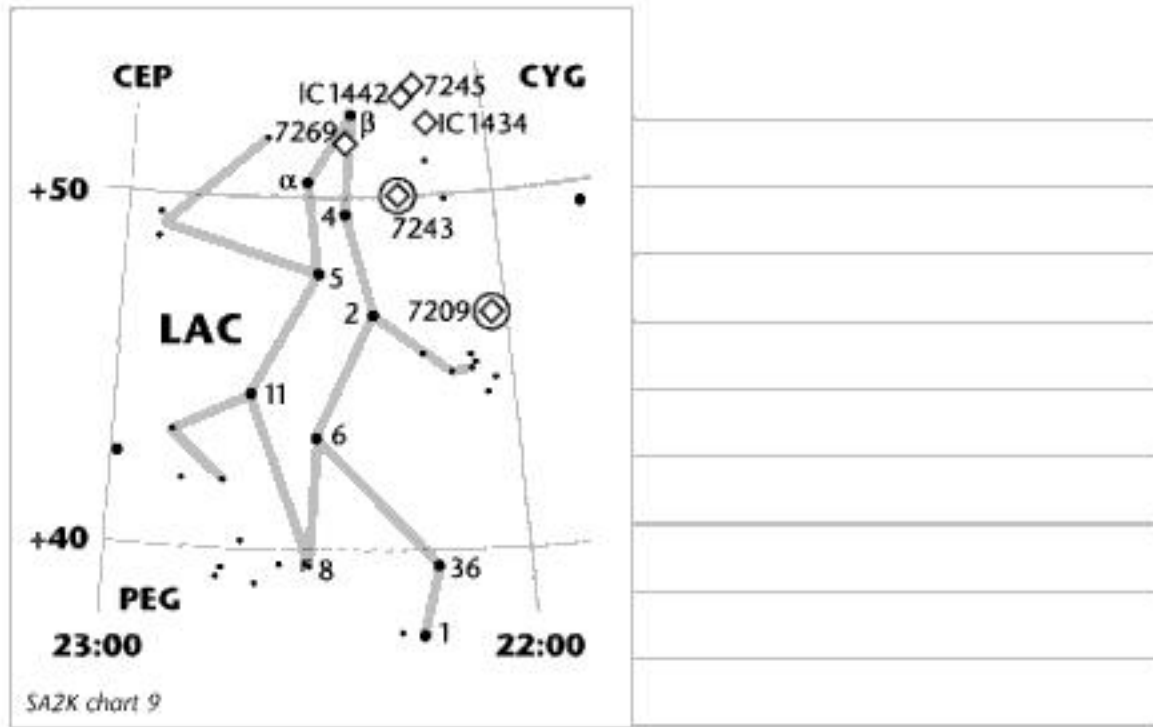
- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ○ Cluster w/Nebulosity
 - ◇ ○ Nebula
 - ◆ ○ Galaxy
- Circle = to mag 7. North is up.

Objects in the Heavens

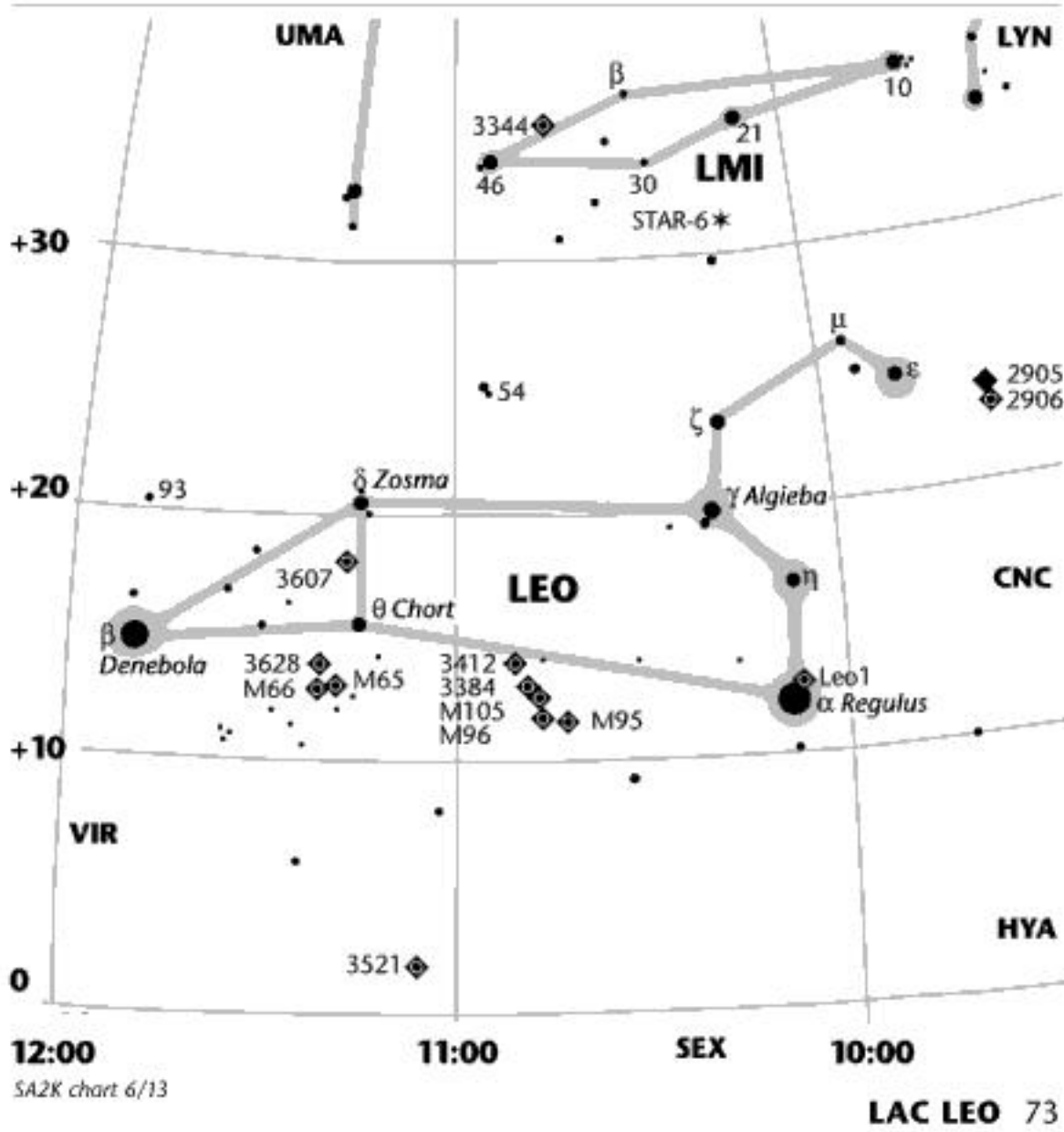
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Lacerta	<i>the Lizard</i>	Autumn Oct10	LAC
<i>"A small and distinctly marked asterism. Glorious sweeping from Cygnus in this direction, and towards the head of Cepheus."</i>			
☆☆8	Quadruple; beautiful	22" 22:35.9 39°38'	6-10
○○NGC7209	OC 50☆☆; curved strings	25' 22:05.1 46°29'	6.8
○○NGC7243	OC ! Dense; 40☆☆; some variable <i>"Fine cluster quickly followed by beautiful field with 3 pairs."</i>	21' 22:15.3 49°54'	6.4
○ NGC7245	OC 50 fine ☆; 4.5° N of NGC7243	5' 22:15.3 54°20'	9.2
○ NGC7296	OC 4 bright ☆ in a line	4' 22:28.2 52°17'	9.5
○ IC1434	OC Fine cluster; 6 branches	8' 22:10.5 52°50'	9.0
○ IC1442	OC In field with NGC7243/7245	5' 22:16.5 54°03'	9.1

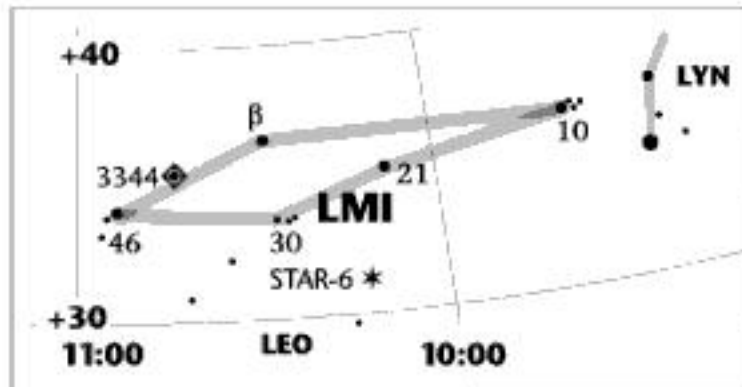
Leo	<i>the Lion</i>	Spring Apr10	LEO
<i>"A fine constellation, the fore part of which is marked to the naked eye by a sickle of conspicuous stars. At the bottom of the handle, and very nearly in the pathway of the sun, is the leader, Regulus, the Lion's Heart."</i>			
☆☆ Regulus α	Heart of the Lion	177" 10:08.4 11°58'	1.4/8
☆☆ Denebola β	Tail ☆; several faint stars involved	11:49.1 14°34'	2.14
☆☆ Algieba γ	! Lion's Mane; finest ☆☆☆; gold	4.4" 10:20.0 19°51'	2.6/4
☆☆ 54	Greenish white/blue	6.5" 10:55.6 24°45'	4/6
○ M65 ₃₆₂₃	SG Sa/Sb; 14° tilt; faint branches	8x2' 11:18.9 13°05'	9.3
○ M66 ₃₆₂₇	SG Sb; brightest of <i>Leo Triplet</i> ; Triplet – M65/M66/NGC3628; 180,000LY apart.	9x4' 11:20.2 12°59'	8.7
○ M95 ₃₃₅₁	SG SBb; barred; bright core	5x3' 10:44.0 11°42'	9.7
○ M96 ₃₃₆₈	SG Sb; round; bright core	8x5' 10:46.8 11°49'	9.1
○ M105 ₃₃₇₉	EG E1; bright core; near 3384/3389	5x5' 10:47.8 12°35'	9.2
○ NGC2903	SG ! Sb; elongated; mottled arms	12x6' 09:32.2 21°30'	8.9
○ NGC2905	GC In 2903; very fine; resolvable	11x5' 09:32.2 21°31'	10.0
○ NGC3384	EG E7/S0; in field of M105/NGC3389	7x4' 10:48.3 12°38'	9.9
○ NGC3412	EG E5/S0; circular; difficult	4x2' 10:50.9 13°25'	10.0
○ NGC3521	SG Sb; elongated; dusty; bright	9x5' 11:05.8 00°02'	8.8
○ NGC3607	EG E5/S0; rich; faint; near 3605/08	5x4' 11:16.9 18°03'	9.9
○ NGC3628	SG Sb; edge-on; large; Triplet	14x4' 11:20.3 13°36'	9.5
○ Leo1	EG <i>Regulus Galaxy</i> ; dwarf; L 880,000LY away; 1,000LY across.	10x8' 10:08.4 12°18'	9.9

Galaxy designations, p.18 L – Member of Local Group

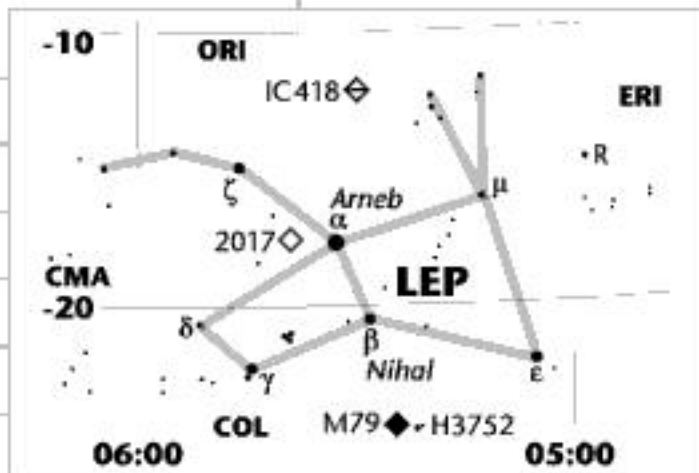


Lacerta is the only map changed from the traditional.

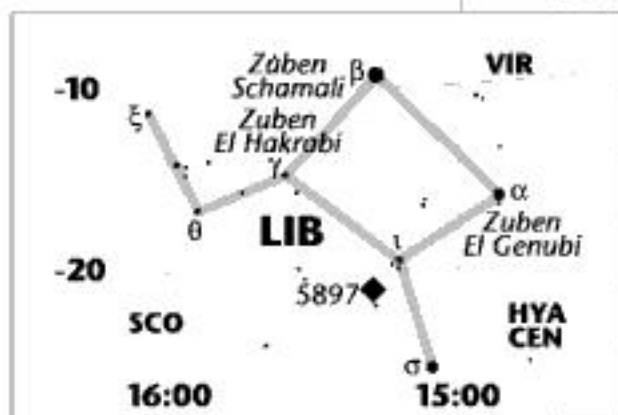




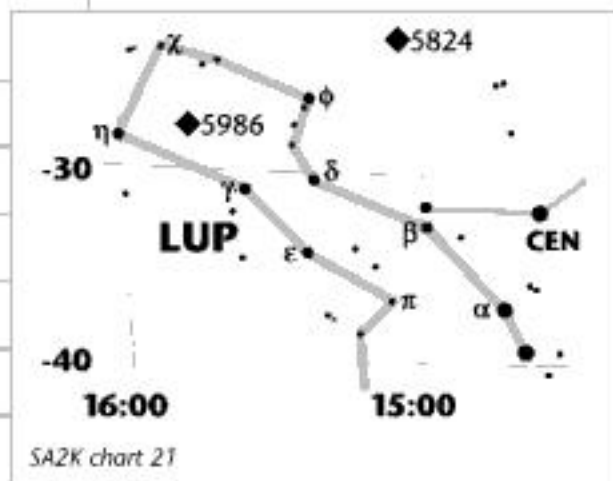
SA2K chart 6



SA2K chart 11



SA2K chart 15/21



SA2K chart 21

- ◊ ◉ Open Cluster
- ◆ ● Globular Cluster
- ◊ ◉ Cluster w/Nebulosity
- ◊ ◉ Nebula
- ◆ ◉ Galaxy

Circle = to mag 7. North is up.

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Lynx	<i>the Lynx</i>	Winter Mar5	LYN

"A troublesome constellation, excepting with an equatorial mounting, as there are few conspicuous leaders among a number of tolerably considerable stars, which are puzzling in the finder. The beauty of its pairs, however, rewards a persevering observer."

☆☆ 12	☆☆☆; 210LY	8.7'	06:46.2	59°27'	5/6/7
☆☆ 19	Easy pair	14.8"	07:22.9	55°17'	4.3/6
☆☆ 38	White/dirty yellow; best @ 190x	2.7"	09:18.8	36°48'	4/6.6
○ NGC2683	SG Sb; UFO Galaxy; edge-on; Arm with dark lanes 1 side; above Leo's head; William Herschel discovery, 1788; 16MLY. Galaxy designations, p.18	9x2.5'	08:52.7	33°25'	9.8

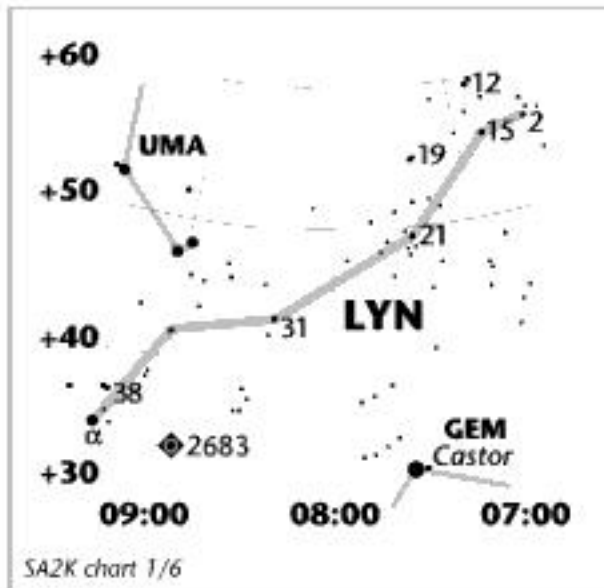
Lyra	<i>the Lyre, Harp, Vulture</i>	Summer Aug15	LYR
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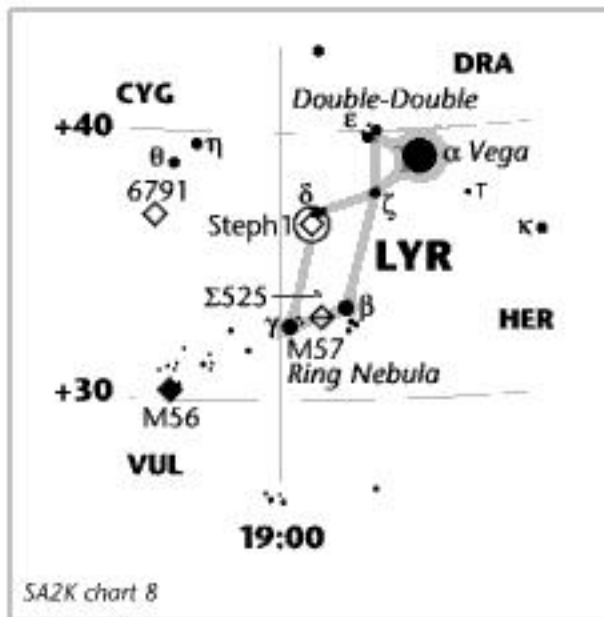
"For its size, one of the most remarkable constellations, full of beautiful fields, and adorned by one of the great leaders of the firmament. Sweeping between Lyra and Cygnus exceedingly fine." Many ☆☆ around Lyr/Cyg.

☆ Vega	α The Eagle; 27LY; 2nd brightest in northern sky; Pole Star in 12,000 years.	18:37.0	38°47'	.03	
☆☆ Beta	β ☆☆☆☆; cream/blue	46"/67"/86"	18:50.1	33°22'	3.4-9
☆☆ Delta	δ ☆☆☆☆; red/blue	79"	18:44.8	37°36'	4-11.5
☆☆ Double/Double	ε A-B at 2.5' sep then each at 2-3" Great sighting test. A-B mag 5.0/6.1; C-D mag 5.2/5.5	18:44.3	39°40'		
☆☆ Zeta	ζ Topaz/green	44"	18:44.8	37°36'	4.3/6
☆☆ Σ525	Alberio-like	45"	18:54.9	33°58'	6/7.7
☆ T	Carbon ☆; very red	18:32.0	37°00'	7/7.8	
○ M56 ⁶⁷⁷⁹	GC Highly resolved in rich area	5'	19:16.6	30°11'	8.2
○ M57 ⁶⁷²⁰	PN ! Ring Nebula; 4,100LY The only annular nebula accessible by common telescopes. Look for star in center of the ring, variable from mag 14-16.	1.4x1'	18:53.6	33°02'	8.9
○ NGC6791	OC Large; hundreds of faint ☆	16'	19:20.7	37°51'	9.5
○○ Steph1 OC	δ-LYR OC; -4° N of M57; 12☆	20'	18:53.5	36°55'	3.8

M57-LYR
The Ring Nebula





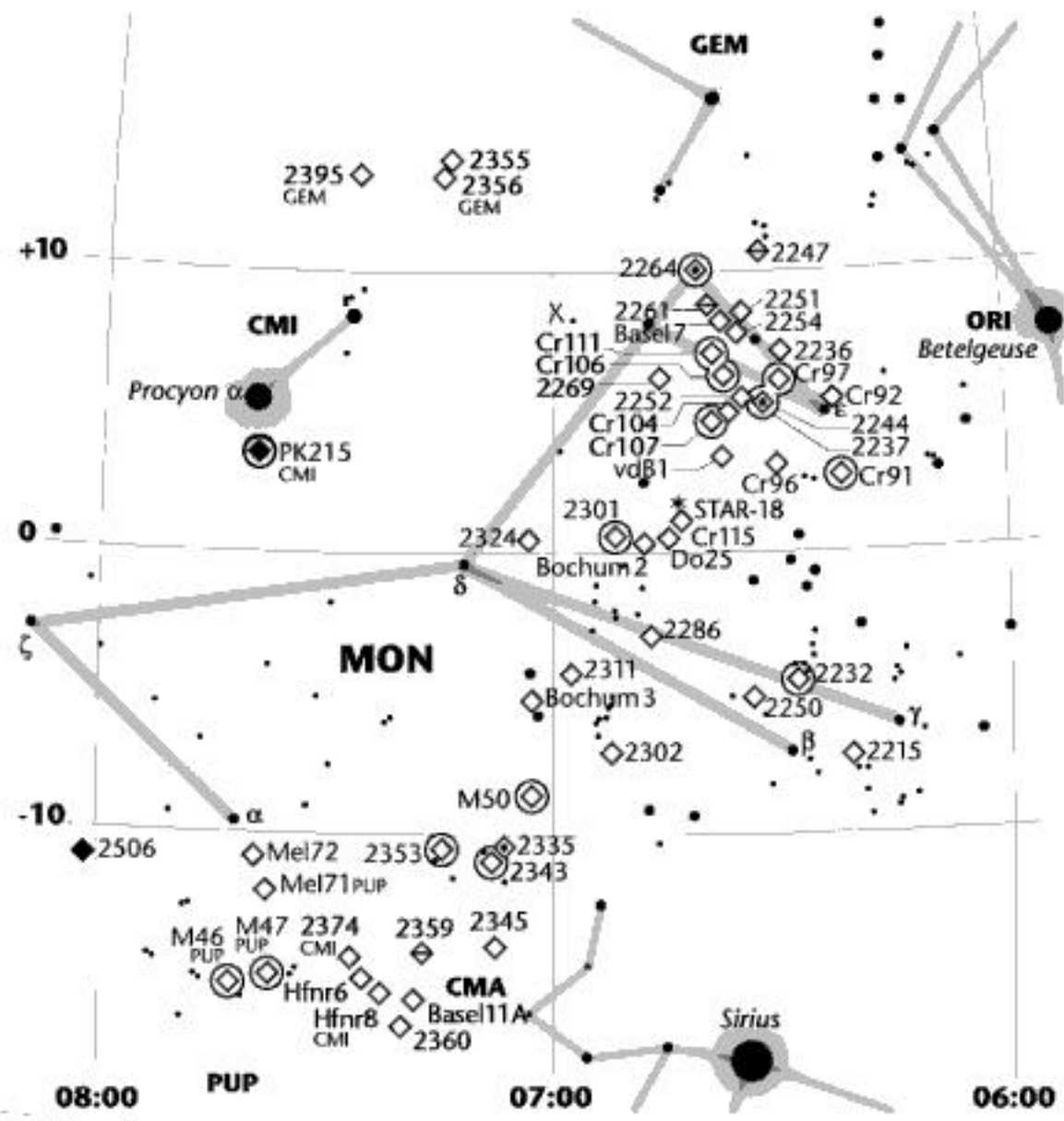


- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ○ Cluster w/Nebulosity
 - ◇ ○ Nebula
 - ◆ ○ Galaxy
- Circle = to mag 7. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Monoceros	<i>the Unicorn</i>	Winter Feb20	MON
<i>"Inconspicuous to the naked eye, but rich in groups and clusters."</i>			
☆☆ Beta	β ! ☆☆☆; white/pearl gray	7.3" 06:28.8 -07°02'	5/5/6
☆☆ Epsilon	ε Gold/blue	13.4" 06:23.8 04°36'	4.5/6
☆ X	Binoc variable, 156 days; semi-reg	06:52.0 08°00'	7.4-9.1
○○ M50 2323	OC Heart Cluster; 100☆ mag9-14; Rich; brilliant; compressed; nice in low power.	16' 07:03.2 -08°20'	6.0
○ NGC2215	OC Large; compressed; irregular	11' 06:20.8 -07°17'	8.4
○○ NGC2232	OC Bright; scattered	30' 06:28.0 -04°51'	3.9
○ NGC2236	OC Pretty rich/comp; 50☆	7' 06:29.7 06°50'	8.5
○ NGC2237	C/N !! Rosette Nebula; Around NGC2244 ; faint star in nebulosity; UHC filter; <i>"This area well repays the trouble of sweeping."</i>	80x60' 06:32.3 05°03'	5.5
○○ NGC2244	C/N ! with Rosette; low power	24' 06:31.9 04°57'	4.8
○ NGC2247	RN Quite diffuse, mottled	4x3' 06:33.1 10°21'	10.0
○ NGC2250	OC Round; irregular, faint	8' 06:33.8 -05°05'	8.9
○○ NGC2251	OC Very large; extended; 25☆	10' 06:34.6 08°22'	7.3
○ NGC2252	OC Large; attractive curves	20' 06:34.7 05°22'	7.7
○ NGC2254	OC Faint; 5☆; misty background	4' 06:35.8 07°40'	9.1
○ NGC2261	ER Hubble's Variable Nebula; Comet-like; nebulosity surrounding R Mon.	2x1' 06:39.2 08°44'	9.5
○○ NGC2264	C/N !! Christmas Tree Cluster; Cone Neb at top of the "tree"; 20☆ mag6-10.	20' 06:41.0 09°54'	3.9
○ NGC2269	OC Small V-shape; 13☆ in oval	4' 06:43.3 04°37'	10.0
○ NGC2286	OC Large; compressed; ~100☆	15' 06:47.7 -03°09'	7.5
○○ NGC2301	OC Great Bird of the Galaxy; 60☆	12' 06:51.8 00°28'	6.0
○ NGC2302	OC Sparse; poor; little compressed	3' 06:51.9 -07°05'	8.9
○ NGC2311	OC Mag8+9☆; 35☆ mag11-13	7' 06:57.8 -04°37'	9.5
○ NGC2324	OC 30☆; 5☆ in "Y"	8' 07:04.2 01°03'	8.8
○ NGC2335	C/N Large; little compressed	12' 07:06.9 -10°02'	7.2
○○ NGC2343	OC Sparse; little compressed	7' 07:08.1 -10°37'	6.7
○ NGC2353	OC Large; one very bright ☆	20' 07:14.5 -10°16'	7.0
○ NGC2506	GC Very rich; compressed	7' 08:00.0 -10°46'	7.6
○ Cr91	OC 2 brighter ☆ involved	17' 06:21.7 02°22'	6.4
○ Cr92	OC Poor; scattered; various size ☆	11' 06:22.9 05°07'	8.5
○ Cr96	OC Nice grouping; 3 brighter stars	8' 06:30.3 02°52'	7.3
○ Cr97	OC 30☆; E-W chain; 2,000LY	21' 06:31.4 05°55'	5.4
○ Cr104	OC 30☆; N-S chain; near NGC2244	22' 06:36.5 04°49'	9.6

CONTINUED ◀



SA2K chart 12

- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ● Galaxy

Circle = to mag 7. North is up.

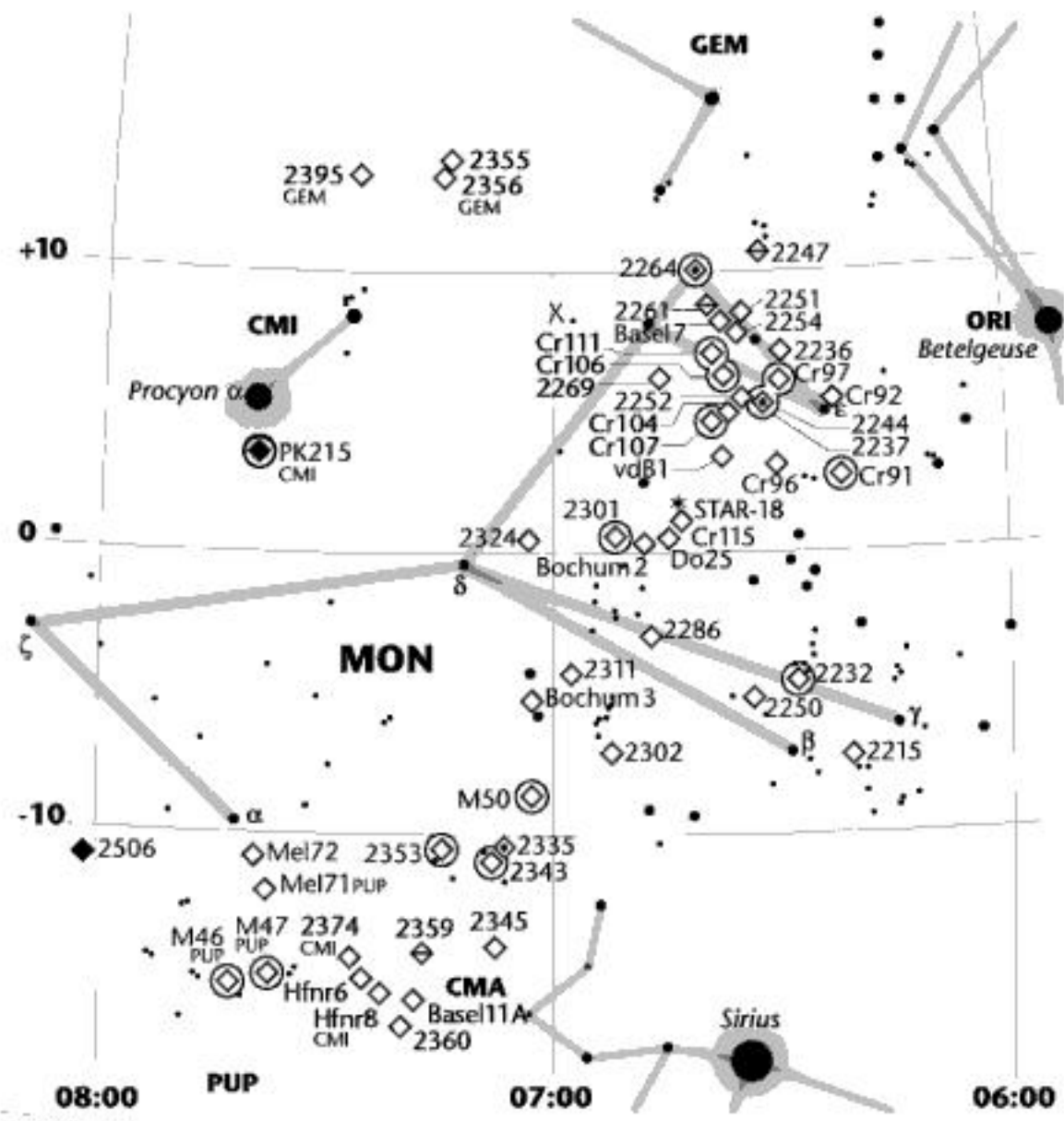
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA	DEC MAG
Monoceros	CONTINUED	Winter Feb20	MON
○ Basel7	OC In rich field, curved strings	5' 06:36.6	08°21' 8.5
○○ Cr106	OC 4-20☆?; ~2° NE of NGC2237	45' 06:37.1	05°57' 4.6
○ vdB1	OC 6+☆ faint neb inv; UHC helps	5' 06:37.5	03°04' 9.5
○ Cr107	OC 15☆; large; sparse; 5,540LY	35' 06:37.7	04°44' 5.1
○ Cr111	OC Several ☆☆; 7 brighter ☆	3.2' 06:38.7	06°54' 7.0
○ Do25	OC 2 E-W chains of mag 10-12☆	25' 06:45.1	00°18' 7.6
○ Cr115	OC Rectangular; many strings; nice	7' 06:46.5	01°46' 9.1
○ STAR-18	Ast Pakan's 3	40' 06:47.9	02°25' —
○ Boc2	OC Very poor cluster; few stars	6' 06:48.9	00°23' 9.7
○ Boc3	OC Moderate compressed; rich field	4' 07:03.4	-05°04' 9.9
○ Mel72	OC 40☆, many faint; triangle	9' 07:38.4	-10°41' 10.0

NGC2264-MON, The Cone Nebula at top of the Christmas Tree Cluster. Imaged as seen in a reflector



80 **MON**



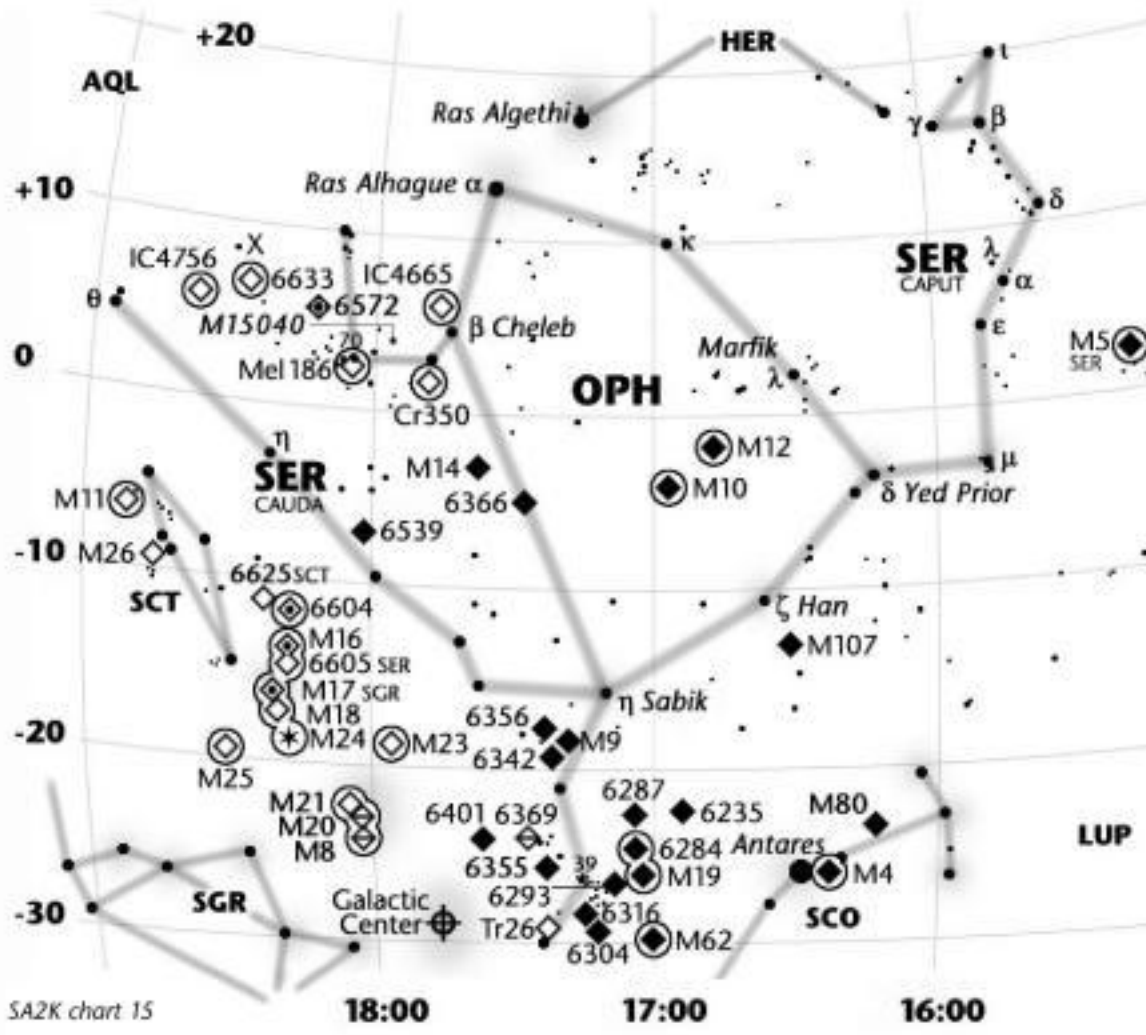
SA2K chart 12

- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ● Galaxy

Circle = to mag 7. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Ophiuchus	<i>the Serpent Bearer</i>	Summer Jul25	OPH
<i>"An extensive region, somewhat barren to the eye, but attractive to the telescope."</i>			
☆ RasAlhague α	Sweep triangle (with Altair and Vega), many clusters		2
☆ Munich15040	<i>Barnard's Star</i> ; 2nd closest to Sol	17:57.6 04°41'	9.5
☆☆ Omicron o	Yellow/blue	10.3" 17:18.0 -24°17'	5.4/7
☆☆ Rho ρ	Yellow/blue; 2 companions	3" 16:27.0 -25°30'	5/6
☆☆ 36	Yellow/red	4.4" 17:15.3 -26°36'	5/5
☆☆ 70	Yellow/red, in Mel186	2.8" 18:05.5 02°30'	4.2/6
☆☆ <i>Bull of Poniatowsky</i>	– spreading double in Mel186 <i>In memory of Poland's most glamorous warrior from the early 1800's.</i>	18:01.0 02°50'	4.2/6
☆ X	Binoc variable, 334 days; Mira-type	18:33.0 08°00'	6.8-8.8
○ M9 6333	GC Well resolved; bright middle; 5.5' Smallest GC in OPH; dark neb B64 prominent to the west.	17:19.2 -18°31'	7.5
○○ M10 6254	GC Highly resolved; bright	12.2' 16:57.1 -04°06'	6.6
○ M12 6218	GC Somewhat loose; resolvable	14.5' 16:47.2 -01°57'	6.6
○ M14 6402	GC Many faint ☆, mag14+	6.7' 17:37.6 -03°15'	7.6
○ M19 6273	GC Bright; oblate; well resolved	5.3' 17:02.6 -26°16'	6.6
○ M62 6266	GC Bright; well resolved; rich; Unusual irregular outline; near S edge of OPH.	14.1' 17:01.2 -30°07'	6.5
○ M107 6171	GC Well resolved; small; faint	3.3' 16:32.5 -13°03'	8.2
○ NGC6235	GC No distinct nucleus; faint	1.9' 16:53.4 -22°11'	10.0
○ NGC6284	GC Well resolved; round	2.7' 17:04.5 -24°46'	7.0
○ NGC6287	GC Well resolved; bright	2.7' 17:05.2 -22°42'	9.2
○ NGC6293	GC Bright; well resolved; rich;	3.5' 17:10.2 -26°35'	8.2
○ NGC6304	GC Well resolved; bright; round	3.8' 17:14.5 -29°28'	8.3
○ NGC6316	GC Well resolved; bright core 6304/6316 involved with M19.	4.9' 17:16.6 -28°08'	8.3
○ NGC6342	GC Small faint central area	3' 17:21.2 -19°35'	9.9
○ NGC6355	GC Well resolved; round	6' 17:24.0 -26°21'	9.4
○ NGC6356	GC Well resolved; very bright	3.5' 17:23.6 -17°49'	8.3
○ NGC6366	GC Unresolved; faint	5.8' 17:27.7 -05°05'	10.0
○ NGC6369	DN <i>Pipe Neb</i> ; 7° long dark lane	30' 17:21.0 -27°00'	10.1
○ NGC6401	GC Unresolved; round; 12☆	1' 17:38.6 -23°55'	9.5
○ NGC6572	PN Bright; small; round; blue; <i>The Blue Racquetball Nebula</i>	6" 18:12.0 06°48'	9.0
○○ NGC6633	OC Bright; like M80-Sco; Naked eye object; sparse at high power.	27' 18:27.7 06°34'	4.6
○ Tr26	OC Bright; large; scattered	7' 17:28.5 -29°29'	9.5
○○ IC4665	OC Binoc; 20☆; 1,100LY	41' 17:46.2 05°39'	4.2
○ Cr350	OC 32☆; Nice chains and ☆☆	45' 17:48.1 01°18'	6.1
○○ Mel186	OC 40☆; Peculiar arrangement	4° 18:01.0 02°54'	3.0



- ◊ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◊ ○ Cluster w/Nebulosity
 - ◊ ○ Nebula
 - ◆ ○ Galaxy
- Circle = to mag 7. North is up.



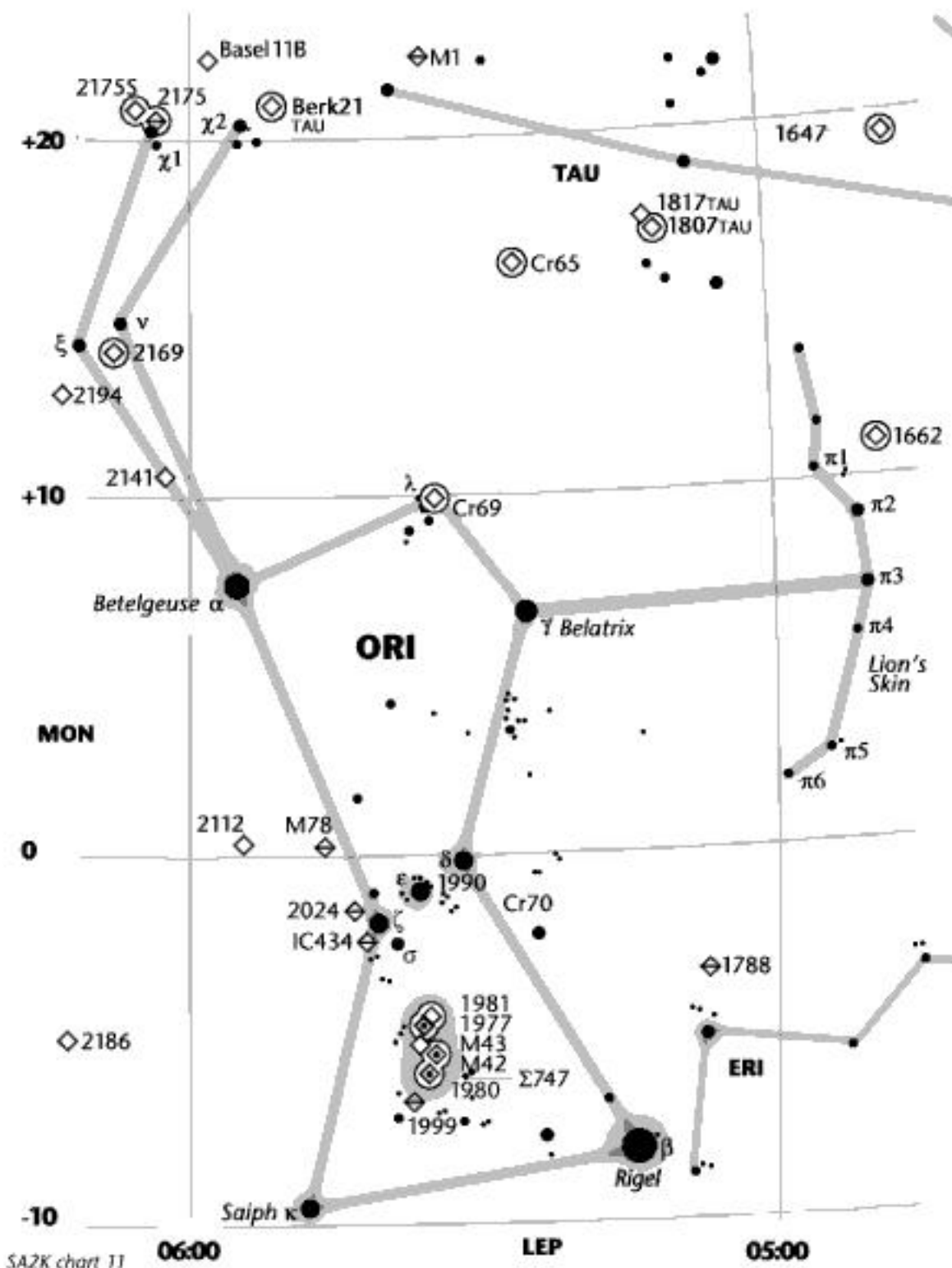
M107-OPH



IC-4665-OPH

Objects in the Heavens

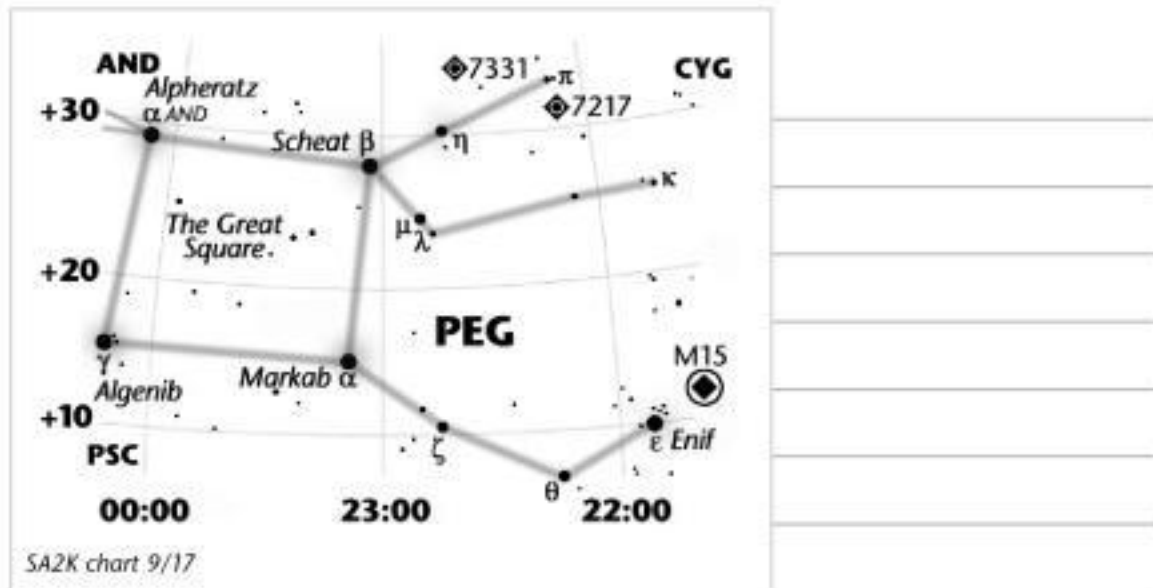
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Orion	<i>the Hunter</i>	Winter Jan25	ORI
<i>"The finest constellation in the heavens, equally remarkable for telescopic interest and obvious brilliancy. Sweeping in many parts most beautiful."</i>			
☆ Betelgeuse	α 4☆ nearby; 800x diam of Sol; var.	05:55.2 07°36'	4-1.3
☆☆ Rigel	β Blue-white SG/blue	9.5" 05:14.5 -08°12'	.1/7
☆ Bellatrix	γ <i>Amazon Star</i> ; faint neb; BlueSG	05:25.8 06°21'	1.6
☆☆ Mintaka	δ White/lilac; ☆☆☆	53" 05:32.0 00°18'	2.5/7
☆☆ Nair al Saif	ι ☆☆☆; white/lt green/purple	11" 05:35.6 -05°55'	3/7
☆ Anilam	ε <i>Arrangement of Pearls</i> ; mid-belt; 4☆	05:36.2 -01°12'	1.7
☆☆ Alnitak	ζ Yellow/blue	2.5"/58" 05:40.8 -01°57'	2-10
☆☆ Sigma	σ White/bluish/red; 4☆: 12.9"/42"	05:38.7 -02°36'	3.8-11
<i>Horsehead IC434 and Flame NGC2024 nebulae nearby;</i>			
☆☆ Σ747	White, near Iota, easy split	35.7" 05:35.4 -06°00'	5/6
OO M42 1976	C/N !! Orion Nebula ; 1,500LY; 90x9'	05:35.4 -05°27'	2.5
<i>"The Great Nebula, visible to the naked eye."</i>			
OO M43 1982	E/R deMairan's Nebula ; 20x15'	05:35.6 -05°16'	9.0
<i>Diffuse nebula; bloated comma; extension of M42.</i>			
○ M78 2068	RN Diffuse reflection ; small	6' 05:46.7 00°03'	7.9
OO NGC1662	OC Scattered large and small ☆	20' 04:48.4 10°57'	6.4
○ NGC1788	RN 2☆ in nebulosity ; diffuse	8x5' 05:06.9 -03°21'	—
○ NGC1977	C/N ! Bright neb. N of M43	40x25' 05:35.3 -04°51'	7.0
○ NGC1980	C/N ! Trapezium ; 4 tiny ☆ in M42; ☆☆☆ θ- and ι-ORI involved; 13"/13"/17" sep; mag5-8.	14' 05:35.4 -05°56'	2.5
OO NGC1981	OC ! Bright ; scattered rich; 10☆; 25'	05:35.2 -04°26'	4.2
<i>"A grand neighborhood. Sweep well over the whole space."</i>			
○ NGC1990	EN Nebulosity around εOri	50' 05:36.0 -04°54'	—
○ NGC1999	EN Bright neb ; hazy; difficult	16x12' 05:36.5 -06°42'	10.0
○ NGC2024	EN ! Flame Nebula ; use OIII; Complex interior detail; Sigma/IC434 nearby.	30' 05:40.7 -02°27'	—
○ NGC2112	OC Pretty comp ; few small ☆	11' 05:53.8 00°25'	9.0
○ NGC2141	OC Large ; rich; faint; 100☆	10' 06:02.9 10°27'	9.4
OO NGC2169	OC Bright ; triangular cluster; 20☆	7' 06:08.4 13°58'	5.9
○ NGC2175	EN Dusty ; 8☆ cluster in nebula	18' 06:09.6 20°29'	6.8
○ NGC2175S	OC Small cluster NE of NGC2175	25' 06:10.9 20°36'	6.8
○ NGC2186	OC Large ; compressed; round	4' 06:12.1 -05°28'	8.7
○ NGC2194	OC Rich , 100 faint ☆; 2169 nearby	10' 06:13.8 12°48'	8.5
OO Cr65	OC 15☆ ; loose lines; rectangular	220' 05:26.0 16°06'	3.0
OO Cr69	OC λ-ORI cluster ; ☆☆☆; ~1,500LY	65' 05:35.1 09°56'	2.8
OO Cr70	OC Orion's Belt ; 1,400LY	150' 05:36.0 -01°00'	0.4
○ IC434	EN Contains Horsehead Nebula	60' 05:39.8 -01°57'	—
○ Bas11B	OC Number '2' pattern	10' 05:58.2 21°58'	8.9



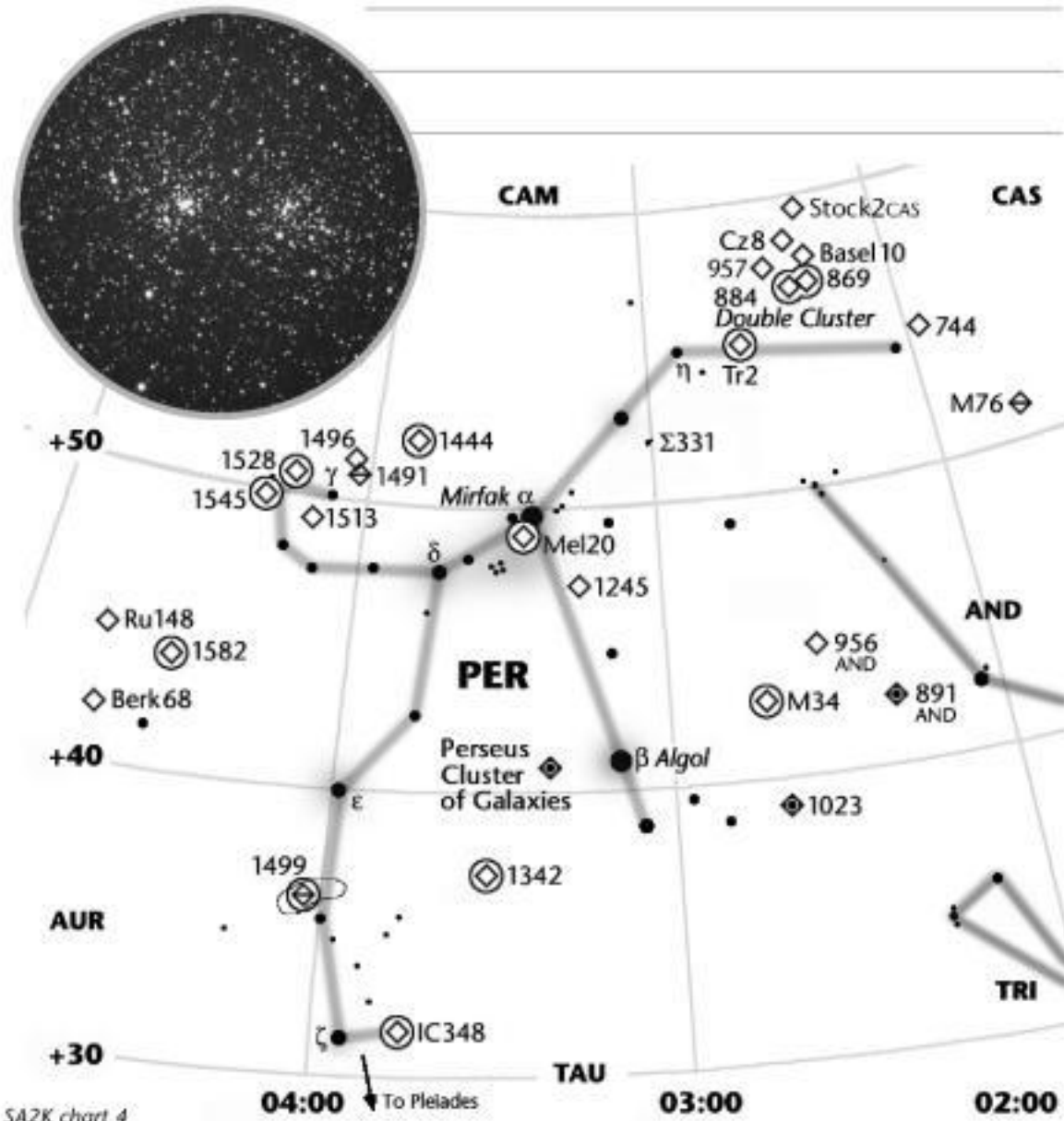
- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ⊕ Cluster w/Nebulosity
 - ◇ ⊕ Nebula
 - ◆ ⊕ Galaxy
- Circle = to mag 7. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Pegasus	<i>the Winged Horse</i>	Autumn Oct20	PEG
<i>"Easily recognized by the great square, one of which is a principle in Andromeda."</i>			
☆ <i>Markab</i>	α <i>The Saddle; SW corner</i>	23:04.8 15°12'	2.5
☆☆ <i>Enif</i>	ε ☆☆☆; yellow/violet	82"/142" 21:44.2 09°52'	2-11
○○ M15 7078	GC ! Highly resolved; 34,000LY; Includes over 115 variable ☆; blazing center.	12.3' 21:30.0 12°10'	6.3
○ <i>NGC7217</i>	SG Sb; bright; brighter middle	4x3' 22:07.9 31°22'	10.0
○ <i>NGC7331</i>	SG ! Sb; small M31; dim; knots; 4 faint galaxies in field.	11x4' 22:37.1 34°25'	9.5
Perseus	<i>Rescuer of Andromeda</i>	Winter Dec25	PER
<i>"Night after night the telescope might be employed in sweeping over its magnificent crowds of stars and many beautiful pairs."</i>			
☆ <i>Algol</i>	β <i>Demon Star; 2.87 day variable</i>	03:08.2 40°57'	2-3.3
☆☆ <i>Epsilon</i>	ε <i>Green/bluish-white</i>	8.8" 03:57.9 40°01'	3/8.3
☆☆ <i>Miram</i>	η <i>Reverse Alberio</i>	28.3" 02:50.7 55°54'	4/8.5'
☆☆ Σ331	<i>White/blue-white</i>	12.1" 03:00.9 52°21'	5/6.7
○○ M34 1039	OC ! 80 ☆/☆☆ mag8+; bright	35' 02:42.0 42°47'	5.4
○ <i>M76</i> 650	PN <i>Little Dumbbell, Cork; irreg.</i>	3x2' 01:42.4 51°34'	10.1
○ <i>NGC744</i>	OC <i>Irregular shape</i>	11' 01:58.5 55°28'	7.9
○○ NGC869	OC !! <i>Double Cluster; West</i>	30' 02:19.1 57°08'	4.3
○○ NGC884	OC !! 350 ☆, 0.5° apart; <i>East</i>	30' 02:22.5 57°09'	4.4
○○ <i>NGC957</i>	OC <i>Resolved long triangle; 50 ☆/☆☆</i>	60' 02:33.6 57°32'	7.2
○○ <i>NGC1023</i>	SG <i>E7p; lens-shaped; diffuse</i>	8x3' 02:40.4 39°04'	9.4
○ <i>NGC1245</i>	OC <i>Rich; compressed; irregular</i>	10' 03:14.7 47°14'	8.4
○○ NGC1342	OC 60 ☆; <i>irregular group</i>	14' 03:31.7 37°22'	6.7
○ NGC1444	OC 30 ☆ <i>mag12-14</i>	4' 03:49.4 52°40'	6.5
○ <i>NGC1491</i>	EN <i>Small; faint; mag11 ☆</i>	4x4' 04:03.4 51°19'	—
○ <i>NGC1496</i>	OC <i>Faint; 1 ☆ mag11; 10 others</i>	6' 04:04.5 52°40'	9.6
○ NGC1499	EN <i>California Neb; diffuse</i>	60x10' 04:03.2 36°22'	5.0
○ <i>NGC1513</i>	OC <i>Large; very rich; 40 ☆</i>	9' 04:09.9 49°31'	8.4
○○ NGC1528	OC <i>Swirl-in-the-swirl; 80 ☆</i>	24' 04:15.3 51°13'	6.4
○ NGC1545	OC <i>Rich; 20 ☆ triangle</i>	18' 04:20.9 50°15'	6.2
○○ NGC1582	OC <i>Rich at low power; little comp.</i>	37' 04:31.8 43°47'	7.0
○○ Tr2	OC <i>Moderate rich; 30 ☆ to m11</i>	20' 02:37.3 55°59'	5.9
○ <i>Bas10</i>	OC <i>Associate of Double Cluster</i>	2' 02:18.8 58°19'	9.9
○ <i>Cz8</i>	OC <i>Half-ring around 1 bright ☆</i>	7' 02:33.0 58°44'	9.7
○○ Mel20	OC <i>Alpha-PER moving cluster</i>	185' 03:22.0 48°36'	1.5
○ IC348	C/N <i>Surrounds Omicron-PER</i>	10' 03:44.5 32°17'	7.0
○ <i>Berk68</i>	OC <i>In rich field; curved strings</i>	12' 04:44.5 42°04'	9.8
○ <i>Ru148</i>	OC <i>Pretty faint; small; loose</i>	3' 04:46.5 44°44'	9.5



The Double Cluster
NGC869/884-PER

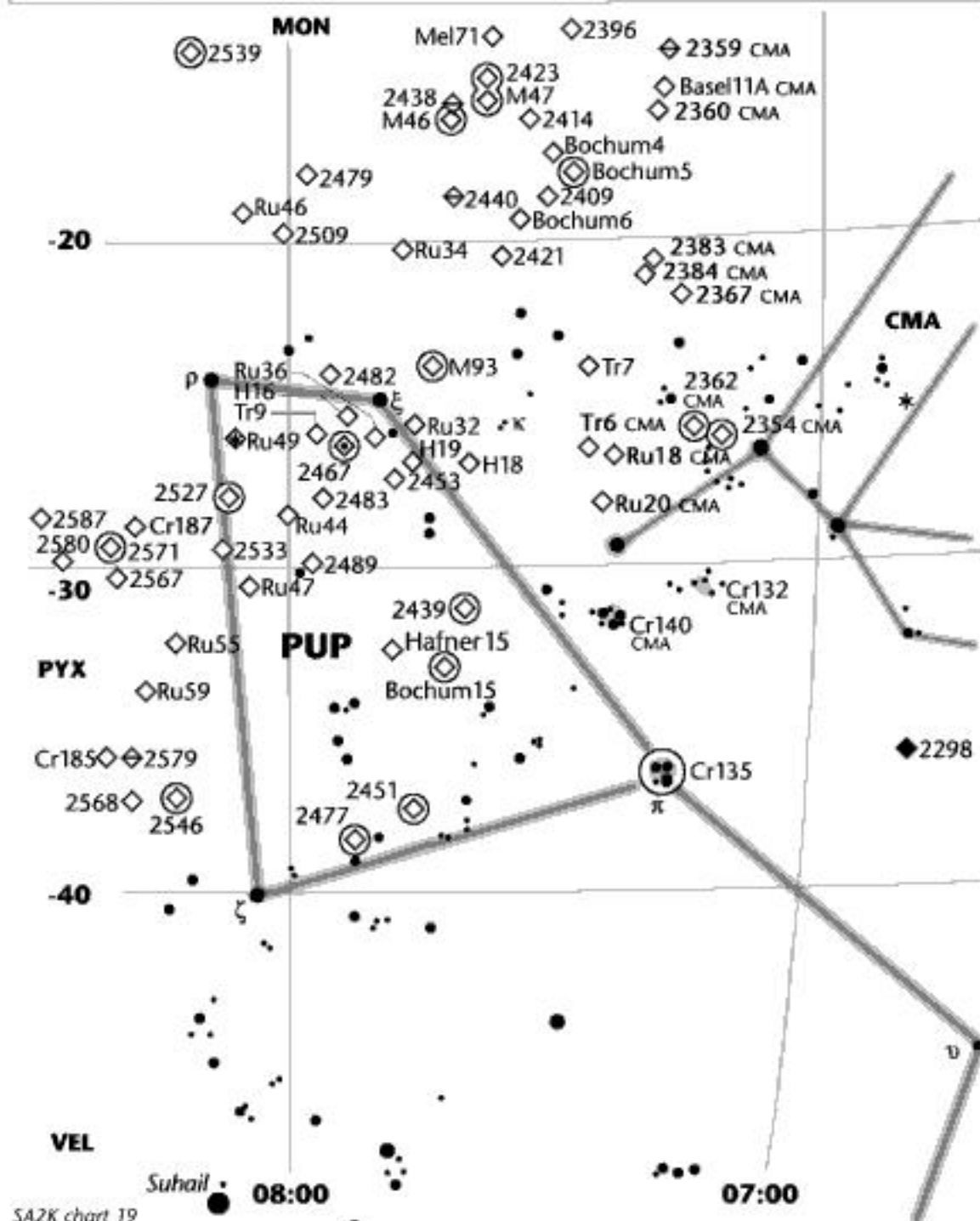
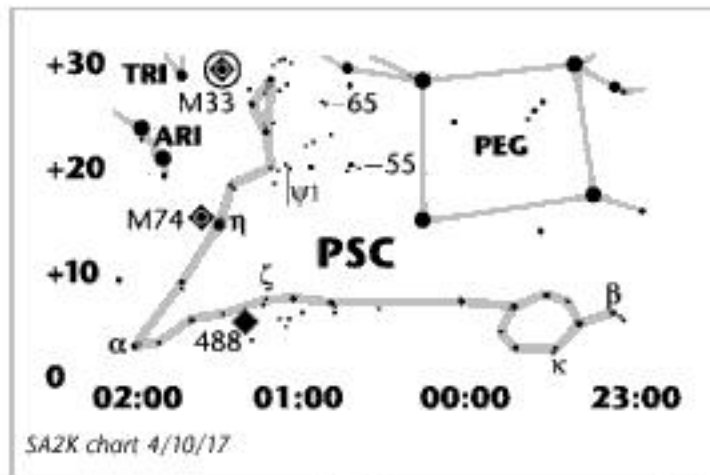


Circled objects indicate bold listing. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Pisces	<i>the Fishes</i>	Autumn Nov10	PSC
<i>"A dull region, containing some good telescopic objects."</i>			
Attractive low-power field around Kappa.			
☆☆ <i>Al Rischa</i> α	Binary; green/blue; Remarkable contrast; overlaps in 2006.	1.9" 02:02.0 02°46'	4.2/5
☆☆ Zeta ζ	☆☆☆; pale yellow/rose	24" 01:13.7 07°35'	5/7
☆☆ Psi 1 ψ	Both blue-white	29.8" 01:05.6 21°28'	5.6/6
☆☆ 55	Orange/blue; striking	6.6" 00:39.9 21°26'	5.6/9
☆☆ 65	Both yellow	4.4" 00:49.9 27°43'	6/6
○ M74 ₆₂₈	SG Sc; mini-Pinwheel (M33-TRI)	10x9' 01:36.7 15°47'	9.6
○ NGC488	SG Sb; delicate spiral pattern	5x4' 01:21.8 05°15'	10.0
Puppis	<i>Stern of Argonaut's Ship</i>	Winter Oct10	PUP
☆☆ <i>Azmidiske</i> ξ	Yellow SG/orange; 5☆ in arc	07:49.3 -24°52'	3.3
☆☆ Kappa κ	Blue-white ☆☆ with mag12☆ 7"/10"	07:38.8 -26°48'	4/4
○○ M46 ₂₄₃₇	OC Rich; large core; 150☆; 6,000LY <i>"Beautiful circular cloud of small stars." PN NGC2438 in front or behind?</i>	27' 07:41.8 -14°49'	6.0
○○ M47 ₂₄₂₂	OC Pretty rich; bright; 1,800LY <i>"Grand, broad group. Visible to the naked eye."</i>	30' 07:36.6 -14°30'	4.5
○ M93 ₂₄₄₇	OC Dense + dark nebula; 63☆	22' 07:44.6 -23°52'	6.2
○ NGC2298	GC Bright; large; round; very rich	7' 06:49.0 -36°00'	9.3
○ NGC2396	OC Scattered; ☆☆ in field at 20" sep	10' 07:27.5 -11°43'	7.4
○ NGC2409	OC Small; bright group of ~8☆	2.5' 07:31.6 -17°11'	7.5
○ NGC2414	OC Large; little compressed	4' 07:33.2 -15°27'	7.9
○ NGC2421	OC Large; considerably rich; 60☆	10' 07:36.2 -20°37'	8.3
○ NGC2423	OC Dense; rich; 60☆; N of M47	19' 07:37.1 -13°52'	6.7
○ NGC2438	PN Nebula ring in front of M46	1.1' 07:41.8 -14°44'	10.0
○ NGC2439	OC Rich; pretty large; compressed	10' 07:40.8 -31°42'	6.9
○ NGC2440	PN Box-shape; bright; rich field	16" 07:41.9 -18°13'	10.0
○○ NGC2451	OC ! Naked eye; large, 36☆	50' 07:45.4 -37°58'	2.8
○ NGC2453	OC Small; pretty rich/compressed	5' 07:47.6 -27°12'	8.3
○ NGC2467	C/N Pretty bright; round	16' 07:52.2 -26°26'	7.0
○ NGC2477	OC ! Dense; bright; rich; 300☆	27' 07:52.3 -38°33'	5.8
○ NGC2479	OC 40☆; faint	7' 07:55.1 -17°42'	9.6
○ NGC2482	OC Considerably rich; open	12' 07:55.2 -24°15'	7.3
○ NGC2483	OC Large; little compressed	10' 07:55.6 -27°53'	7.6
○ NGC2489	OC Considerably rich; compressed	8' 07:56.3 -30°04'	7.9
○ NGC2509	OC Bright; pretty rich; little comp.	8' 08:00.8 -19°03'	9.0
○○ NGC2527	OC Scattered; rich; 40☆	22' 08:05.0 -28°09'	6.5
○ NGC2533	OC Pretty large; rich; comp; 40☆	3.5' 08:07.1 -29°53'	7.6

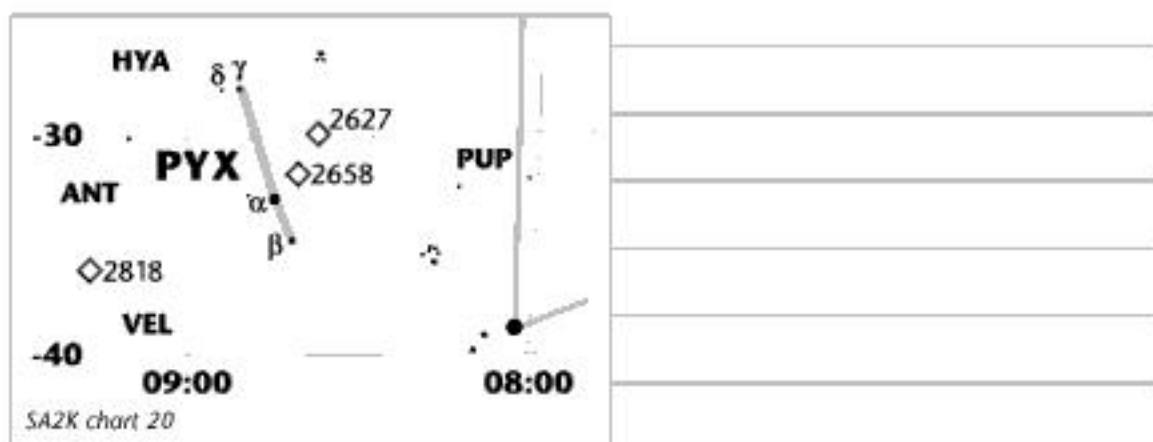
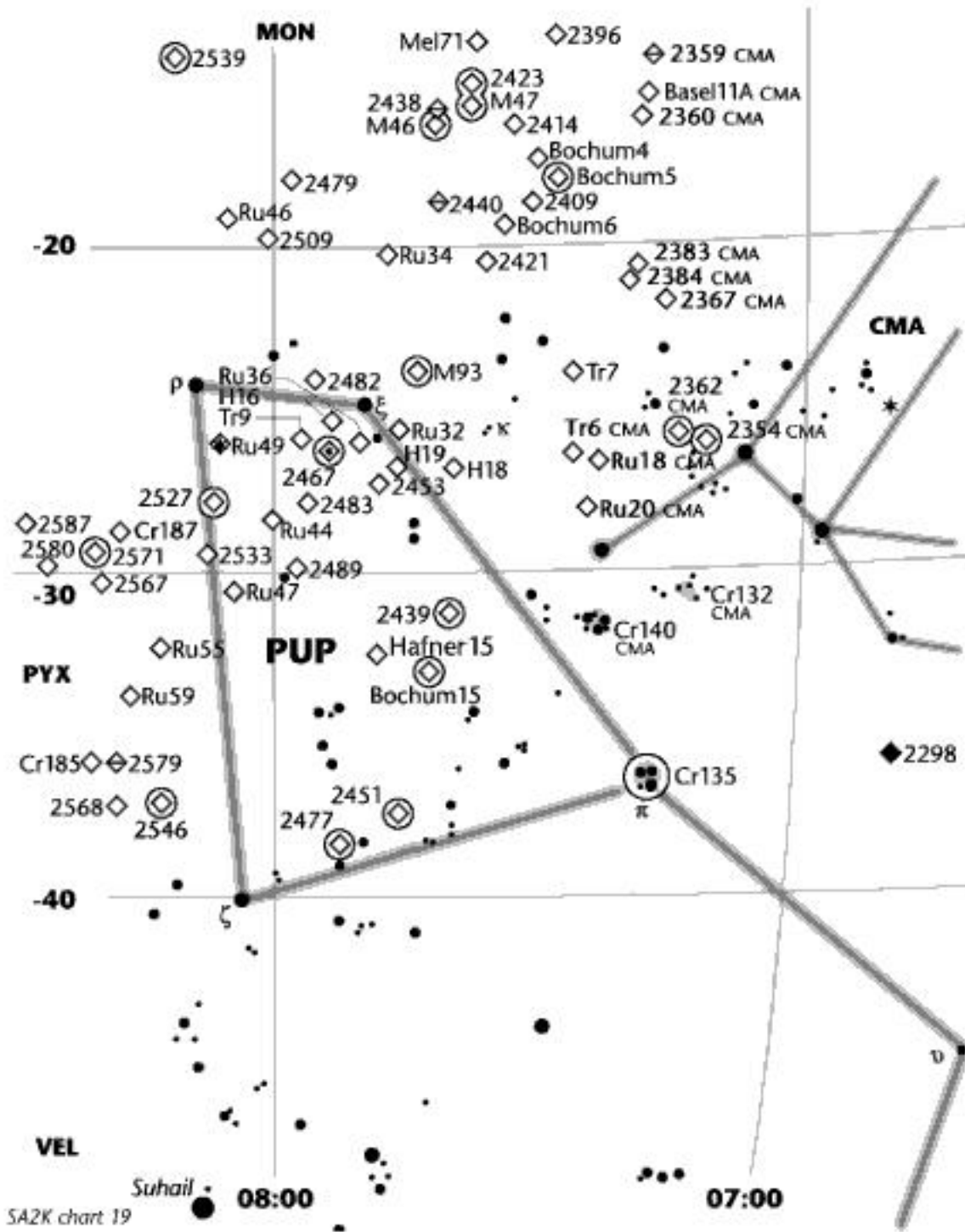
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Circled objects indicate bold listing. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Puppis	CONTINUED	Winter Oct10	PUP
OO NGC2539	OC Large; rich; 50☆; Near M46/47; close 4☆ group in field.	21' 08:10.7 -12°50'	6.5
○ NGC2546	OC Bright; scattered; 33MLY; 50☆	41' 08:12.3 -37°36'	6.3
○ NGC2567	OC Large; rich; irreg round; 50☆	10' 08:18.5 -30°39'	7.4
○ NGC2568	OC Small; faint; compressed	2' 08:18.3 -37°06'	10.0
OO NGC2571	OC Very large; 25☆	13' 08:18.9 -29°45'	7.0
○ NGC2579	EN Among 70☆	10' 08:20.9 -36°13'	7.5
○ NGC2580	OC Pretty rich; 30☆	8' 08:21.5 -30°19'	9.7
○ NGC2587	OC Irreg; faint; tight nucleus; 30☆	9' 08:23.4 -29°31'	9.1
OO Cr135	OC <i>The Pup</i> , π Puppis	50' 07:17.0 -36°50'	2.1
○ Tr7	OC Pretty small; faint; 17☆	5' 07:27.3 -24°02'	7.9
○ Boc5	OC 7☆ in C-shape; orange ☆	11' 07:30.9 -17°04'	7.0
○ Boc4	OC Involved with NGC2409	23' 07:31.0 -16°57'	7.3
○ Boc6	OC 15☆ mag11 and less at 135x	6' 07:32.0 -19°26'	9.9
○ Mel71	OC Very compressed core; 65☆	9' 07:37.5 -12°04'	7.1
○ Boc15	OC 6☆ with haze; high power helps	07:40.1 -33°33'	6.3
○ Ru32	OC Bright; open; 21☆	6' 07:45.0 -25°31'	8.4
○ Haf15	OC Pretty bright; very compressed;	3.5' 07:45.3 -32°47'	9.4
○ Ru34	OC V-shape; pretty compressed	4' 07:45.9 -20°23'	9.5
○ Ru36	OC 10☆ on fuzzy at 135x; Place o-PUP out of view to increase contrast.	4' 07:48.5 -26°18'	9.6
○ Haf16	OC 19☆; very compact; rich field	1.1' 07:50.3 -25°27'	10.0
○ Haf19	OC Tight group of 30+☆; nebulosity	2' 07:52.7 -26°15'	9.4
○ Haf18	OC Few bright stars in rich field	1' 07:53.3 -25°54'	9.3
○ Tr9	OC 40☆ in clumpy groups	9' 07:55.3 -25°56'	8.7
○ Ru44	OC Bright; large; rich; 52☆	5' 07:59.0 -28°35'	7.2
○ Ru46	OC Small; compressed; rich field	2' 08:02.1 -19°28'	9.1
○ Ru47	OC Faint; loose; 1 brighter ☆	5' 08:02.3 -31°06'	9.6
○ Ru49	OC Nice; rich field; many strings	2.5' 08:03.1 -26°47'	9.6
○ Ru55	OC Loose grouping; several ☆☆☆	17' 08:12.3 -32°36'	7.8
○ Ru59	OC Dim; scattered; 25☆	5' 08:19.1 -34°27'	9.0
○ Cr185	OC Involved with NGC2579	9' 08:22.5 -36°10'	7.8
○ Cr187	OC Involved with NGC2571/2567	7' 08:24.2 -29°09'	9.6
Pyxis	<i>the Ship's Compass</i>	Spring Mar15	PYX
○ NGC2627	OC Large; compressed; 70☆	11' 08:37.2 -29°57'	8.4
○ NGC2658	OC Pretty small; little rich	10' 08:43.5 -32°39'	9.2
○ NGC2818	OC Very condensed; bright core	0.6' 09:16.0 -36°38'	8.2

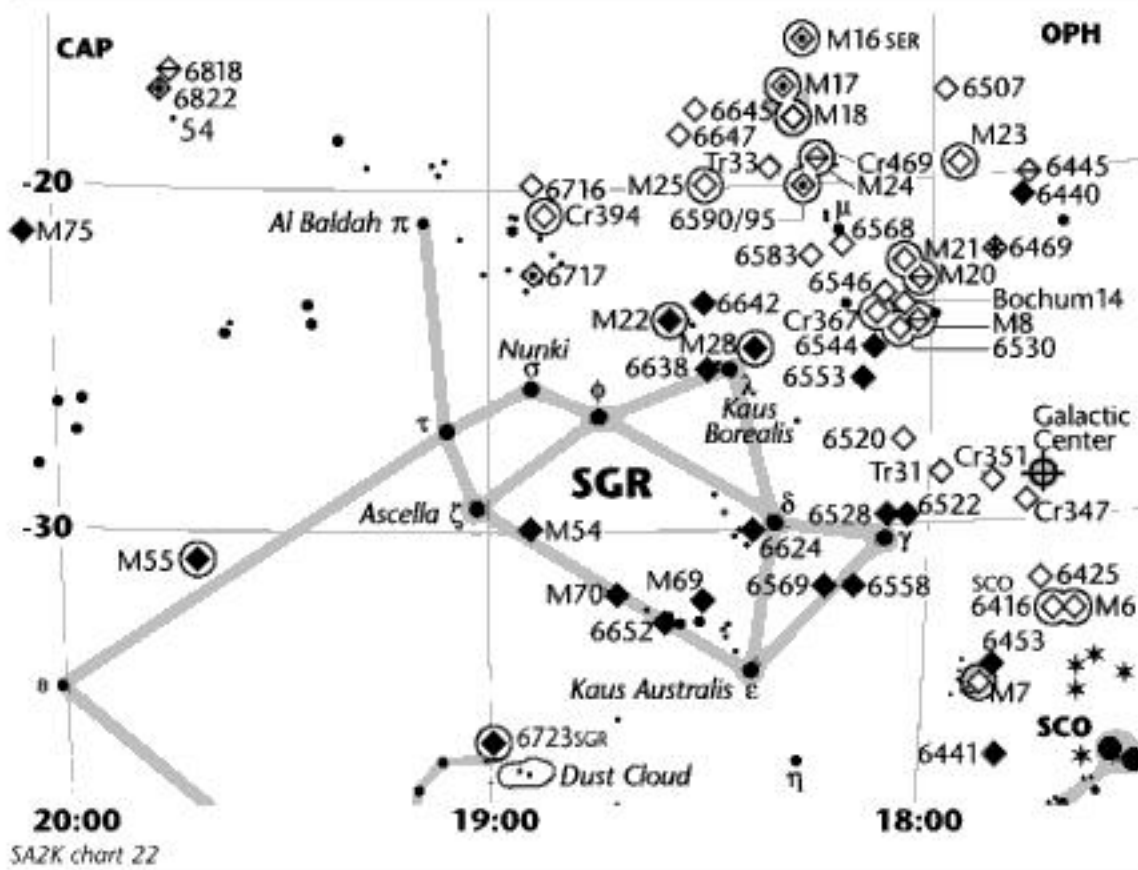
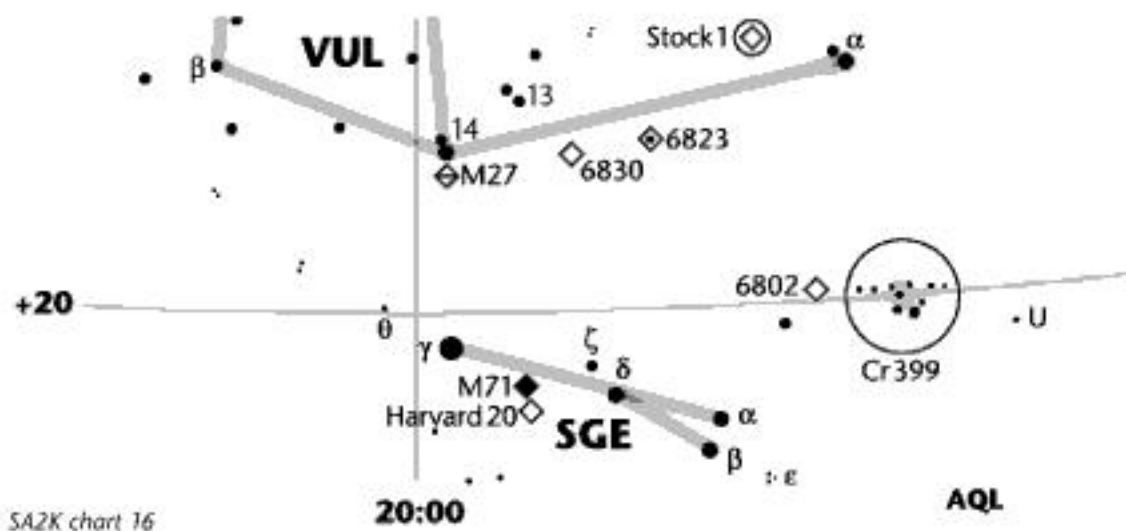


Circled objects indicate bold listing. North is up.

Objects in the Heavens

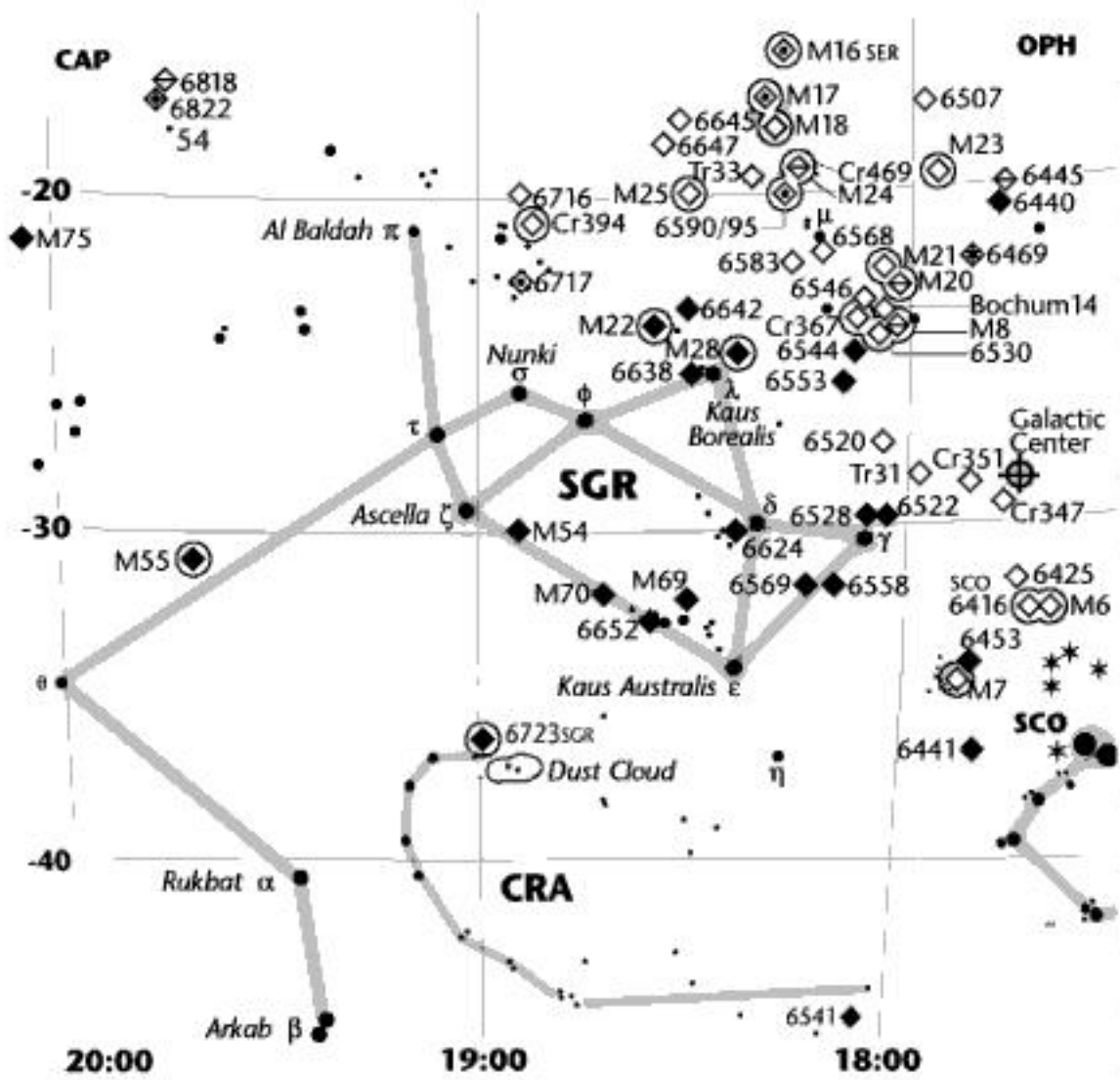
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Sagitta	<i>the Arrow</i>	Summer Aug30	SGE
<i>"Sweeping here magnificent; few coloured stars."</i>			
☆☆ Zeta	ζ Green/blue; tight ☆☆☆	8" 19:48.9 19°09'	5/11
☆☆ Theta	θ Green/blue; ☆☆☆	12"/80" 20:07.7 20°46'	6.5/9
☆ U	Short period variable, 3.3 days	19:14.4 19°26'	6.6-10
○ M71 6838	GC Highly resolved; very rich; One of smallest globular clusters; arrowhead shape.	7' 19:53.8 18°47'	8.2
○ Har20	OC Little compressed; 40☆	12' 19:53.1 18°20'	7.7
Sagittarius	<i>the Archer, the Teapot</i>	Summer Aug20	SGR
<i>"The stars here have a beautiful effect above the south horizon near the place where the Galaxy passes from sight in our latitude; but they are apt to be obscured by haze. We see only the northern edge of a splendid part of the Galaxy."</i>			
☆☆ Mu	μ 4☆, with NGC6568	17-50" 18:13.7 -21°04'	4-11
☆☆ Al Baldah π	☆☆☆	1" 19:09.7 -21°01'	4/4/6
☆☆ 54	Yellow/blue	46" 19:40.7 -16°17'	5.5/9
○○M8 6523	EN ! Lagoon Nebula; very fine; 2nd brightest neb in N skies; NGC 6530 inside; 5,000LY.	45x9' 18:03.8 -24°23'	5.6
○ M16 (Ser) EN	! Eagle Nebula; 60☆ mag8+; Extensive nebulosity; see SER/SCT for nearby objects.	7' 18:18.8 -13°47'	6.0
○○M17 6618	C/N ! Horseshoe/Swan/Omega Nebula	11' 18:20.8 -16°11'	6.8
○○M18 6613	OC Bright; 12☆; busy background	9' 18:19.9 -17°08'	6.9
○○M20 6514	ER Trifid Nebula; OIII filter helps E/R Neb with embedded cluster NGC 6611.	28' 18:02.3 -23°02'	6.3
○ M21 6531	OC Rich; little compressed; 50☆	13' 18:04.6 -22°30'	6.0
○○M22 6656	GC ! Finest naked eye cluster	24' 18:36.4 -23°54'	5.3
○○M23 6494	OC Dense; bright, round; ~100☆	27' 17:56.8 -19°01'	5.7
○○M24 IC4715	OC Small Sgr Star Cloud; Very rich/compressed; use binocs; faint cluster 6603 inside.	120x90' 18:16.5 -18°50'	4.6
○○M25 IC4725	OC Use binocs; 50☆ mag6-10	29' 18:31.6 -19°15'	4.7
○○M28 6626	GC Bright; tight; highly resolved	15' 18:24.5 -24°52'	6.9
○ M54 6715	GC Mottled; very bright; 82MLY	9' 18:55.1 -30°29'	7.6
○ M55 6809	GC Highly resolved; 16MLY	19' 19:40.0 -30°58'	6.3
○ M69 6637	GC Well resolved; bright; 40☆	7.1' 18:31.4 -32°21'	7.6
○ M70 6681	GC Curved arc of ☆ to NW	7.8' 18:43.2 -32°18'	8.1
○ M75 6864	GC Open; unresolved; bright core	6' 20:06.1 -21°55'	8.3
○ NGC6440	GC Unresolved; bright middle	1.7' 17:48.9 -20°22'	9.3
○ NGC6445	PN Crescent Nebula; Fine bright oval; small M27.	34" 17:49.2 -20°01'	10.5
○ NGC6469	OC Round; irregular	12' 17:53.2 -22°17'	8.2

CONTINUED ←



- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ○ Galaxy

Circle = to mag 7. North is up.



SA2K chart 22

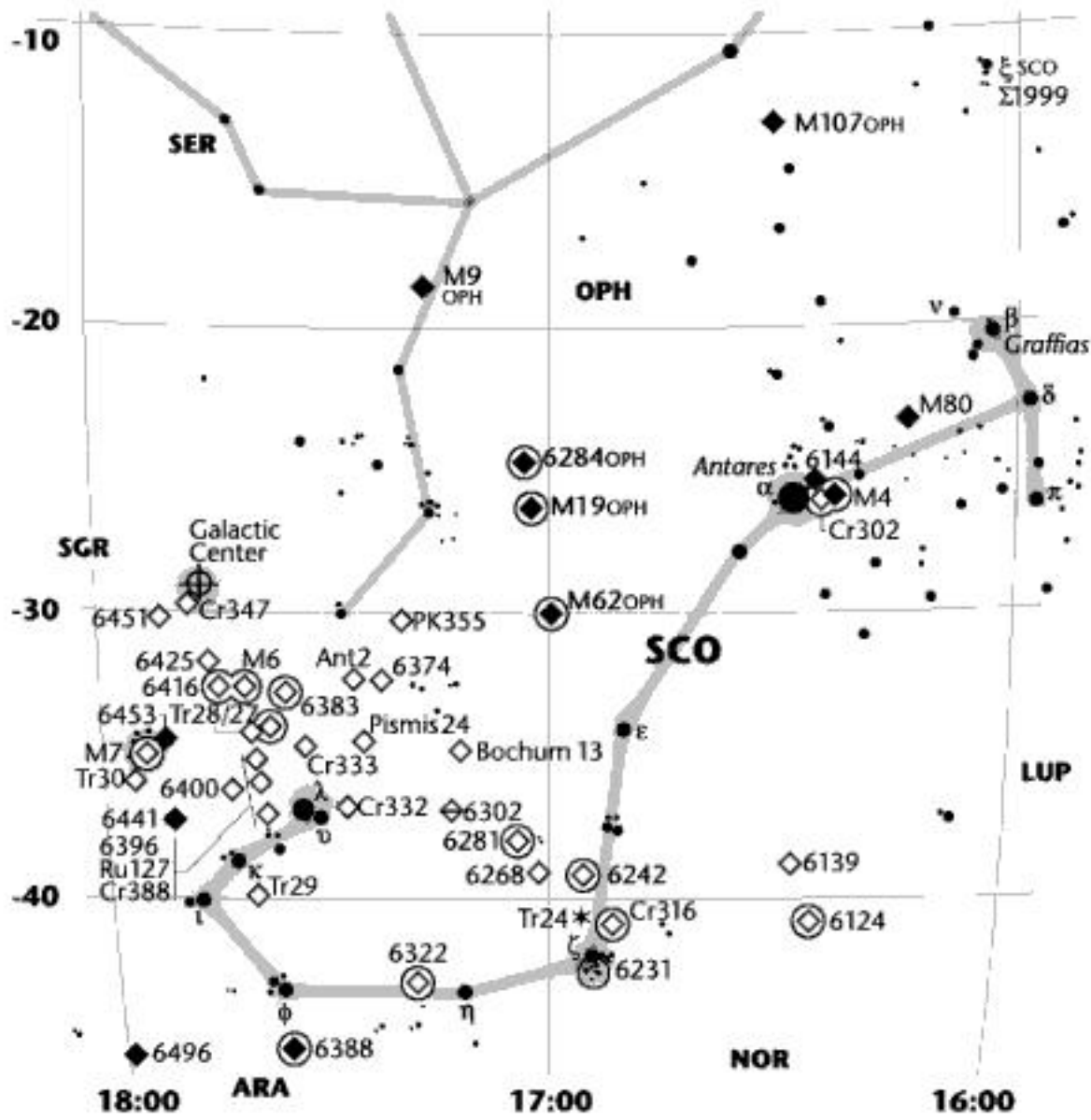
- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ○ Cluster w/Nebulosity
- ◇ ○ Nebula
- ◆ ● Galaxy

Circle = to mag 7. North is up.

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Scorpius	<i>the Scorpion</i>	Summer Jul20	SCO
<i>"Looking out for it it will repay an hour or two of extra watching."</i>			
☆☆ Antares	α Red SG/green; 15th brightest; 500x Sun's diameter at 400MM miles wide.	3" 16:29.6 -26°36'	0.9-1
☆☆ Graffias	β Yellow/green; contrast!	13.6" 16:05.4 -19°48'	2.6/5
☆☆ Shaula/Lesath	λ/ν ! The Scorpion's tail stars	10" 17:33.6 -37°07'	1.6/3
☆☆ Jabbah	ν !! 4☆; must see	1"/2"/41" 16:12.0 -19°28'	4/6.4
☆☆ Xi	ξ White/gray; multiple	7.6" 16:04.4 -11°22'	4.8/7
☆☆ Σ1999	Pale yel/orng; south of Xi	11.6" 16:04.4 -11°27'	7.4/8
○○M4 6121	GC Closest globular to earth; Highly resolved loose structure; dark center lane.	26' 16:23.6 -26°32'	5.5
○○M6 6405	OC Butterfly Cluster; 51☆ to mag10	20' 17:40.1 -32°13'	5.2
○○M7 6475	OC ! Ptolemy's Cluster; 80☆	80' 17:53.9 -34°49'	4.0
○ M80 6093	GC Bright; variable; great field	5.1' 16:17.0 -22°59'	7.3
○○NGC6124	OC 2 clusters; 100☆ mag9-12; Good for all instruments.	29' 16:25.3 -40°39'	5.8
○ NGC6139	OC Bright; unresolved; round	5.5' 16:27.7 -38°51'	9.1
○ NGC6144	GC Rich; compressed; near Antares	6' 16:27.2 -26°01'	9.0
○○NGC6231	C/N ! Bright; scattered + nebula; The Table/Jewel Box; one of the finest clusters; 100+☆.	15' 16:54.2 -41°49'	2.6
○ NGC6242	OC Rich; bright; 45☆	9' 16:55.6 -39°28'	6.4
○ NGC6268	OC Bright; pretty rich; 30☆	6' 17:02.2 -39°44'	9.5
○ NGC6281	OC Triangular; dense; w/Neb; 25☆	200' 17:04.7 -37°59'	5.4
○ NGC6302	PN Bug Nebula; long, dark lane	45" 17:13.7 -37°06'	9.7
○ NGC6322	OC Rich; little comp; 25☆ faint	10' 17:18.4 -42°56'	6.0
○ NGC6374	OC Small; sparse; one bright ☆	20' 17:34.7 -32°35'	9.0
○ NGC6383	OC 12☆ faint, around ☆☆	20' 17:34.8 -32°35'	5.5
○ NGC6388	GC Bright middle; round	8.7' 17:36.3 -44°44'	6.8
○ NGC6396	OC Pretty large; little rich/comp.	3' 17:37.6 -35°02'	8.5
○ NGC6400	OC Pretty rich; irregular; 25☆	12' 17:40.2 -36°57'	8.8
○ NGC6416	OC Scattered; rich; 25☆; near M6	14' 17:44.3 -32°22'	5.7
○ NGC6425	OC Pretty rich; 15☆	10' 17:47.0 -31°32'	7.2
○ NGC6441	GC Bright; round; well resolved	7.8' 17:50.2 -37°03'	7.3
○ NGC6451	OC Tom Thumb Cluster; rich; 50☆	9.8' 17:50.7 -30°13'	8.2
○ NGC6453	GC In field of M7; resolvable	3.5' 17:50.9 -34°36'	9.9
○ NGC6496	GC Pretty faint/comp; 10☆ at 165x	6.9' 17:59.0 -44°16'	9.2
○○ Cr302	OC In field with M4	500' 16:26.0 -26°00'	1.0
○○ Cr316	OC Between NGC6231/6242	105' 16:55.5 -40°50'	3.4
○ Tr24	OC 200☆; rich Milky Way field	60' 16:57.0 -40°40'	8.6

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SA2K chart 22

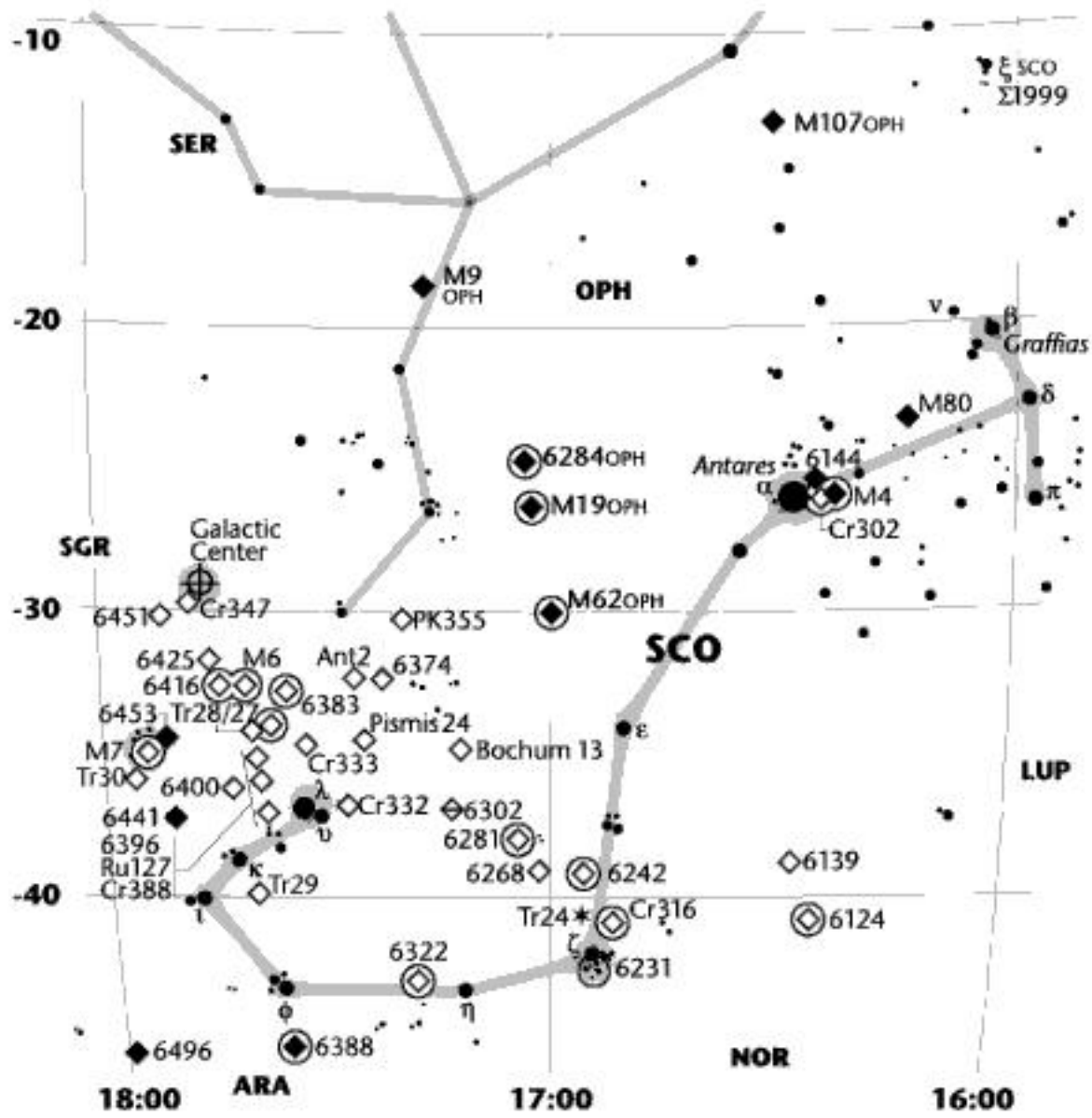
- ◇ ○ Open Cluster
- ◆ ● Globular Cluster
- ◇ ⊕ Cluster w/Nebulosity
- ◇ ⊕ Nebula
- ◆ ⊕ Galaxy

Circle = to mag 7. North is up.

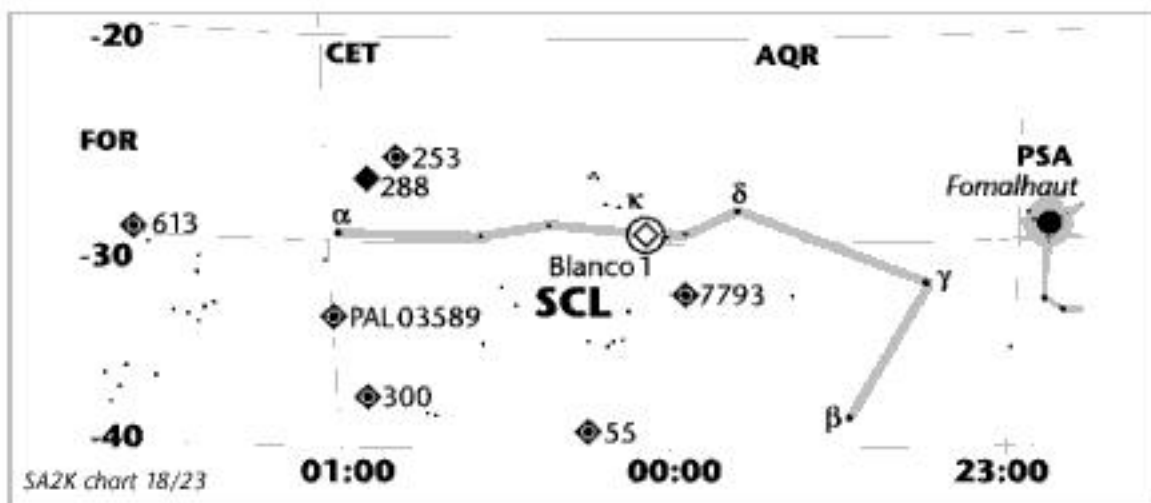
Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Scorpius	CONTINUED	Summer Jul20	SCO
○ Boc13	OC Semicircle with 2 brighter ☆	15' 17:17.3 -35°33'	7.2
○ PK355+3.2	OC Very near NGC6304-OPH	11' 17:21.5 -30°21'	10.0
○ Pismis24	OC 10☆; poor; curve of 4☆	4' 17:25.3 -34°21'	9.6
○ Ant2	OC Small; dim ☆s in average region	3' 17:29.7 -32°30'	8.8
○ Cr332	OC Involves nebula NGC6334	10' 17:30.8 -37°05'	8.9
○ Cr333	OC Involves nebula NGC6357	5' 17:31.3 -34°05'	9.5
○ Tr27	OC Tight group of 12☆	7' 17:36.2 -33°29'	6.7
○ Tr28	OC Scattered	8' 17:36.8 -32°39'	7.7
○ Ru127	OC Arrowhead shape, poor	8' 17:37.7 -36°16'	8.8
○○Cr338	OC Coarse; contrast to NGC6400	25' 17:38.2 -37°43'	8.0
○ Tr29	OC 20☆; 3 brighter ☆	9' 17:41.6 -40°06'	7.5
○ Tr30	OC In field of M7, irregular	10' 17:56.5 -35°19'	7.8

Sculptor	<i>the Sculptor's Tools</i>	Autumn Nov10	SCL
<i>"Very low and contains no bright stars; situated below β Ceti."</i>			
☆☆ Kappa	κ Similar sized	12" 00:09.3 -28°00'	5.4
☆ R	Very red	01:27.0 -32°30'	6-8.8
○ NGC7793	SG Sd; dim; bright knots	9.6x6.4' 23:57.8 -32°35'	9.1
○○NGC55	EG ! Sbp; something for everyone	31x6' 00:14.9 -39°11'	7.9
○○NGC253	EG ! Sc; <i>Sculptor Galaxy</i> ; edge-on; 26x6'	00:47.6 -25°17'	7.1
In Sculptor Group (South Galactic Polar Group).			
○ NGC288	GC Bright; highly resolved; loose	13.8' 00:52.8 -26°35'	7.6
○ NGC300	SG Sc-Sd; dim; very irregular	19x10' 00:54.8 -37°41'	8.2
○ NGC613	EG SBc; bright; starlike nucleus	5x4' 01:34.3 -29°25'	10.0
○○ Bla1	OC ζ-SCL cluster	90' 00:04.3 -29°56'	4.5
○ Pal03589	EG Sculptor Dwarf Galaxy	40x30' 01:00.1 -33°43'	8.8
<small>Galaxy designations, p.18</small>			



SA2K chart 22



SA2K chart 18/23

SCO SCL 99

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG

Scutum *the Shield* Summer Aug15 **SCT**

"Scutum Sobieskii: This asterism, which worthily associates the memory of the Polish hero with the most brilliant part of the Galaxy visible in our latitude, is full of splendid telescopic fields; and the very ground of the Milky Way seems here resolvable."

☆☆ Σ2306	Yellow/deep blue	12"	18:19.0 -15°00'	7-8
☆ R	Binoc variable, 140 days		18:42.0 -05°00'	4.5-8.2
○○M11 6705	OC !! Wild Duck ; semi-globular; Very bright; 500☆ mag9-14; fan-shaped.	14'	18:51.1 -06°16'	6.0
○ M26 6694	OC Rich; pretty compressed; 70☆	15'	18:45.2 -09°24'	8.3
○ NGC6625	OC Little compressed/rich	39'	18:23.2 -12°03'	9.0
○ NGC6649	OC Little comp; 25☆ mag11-14	6'	18:33.5 -10°24'	8.9
○ NGC6664	OC Long; rich; scattered; 25☆	16'	18:36.6 -07°49'	7.8
○ NGC6683	OC In Scutum Cloud; not an OC?	11'	18:42.2 -06°17'	9.4
○ NGC6704	OC Bright; 60☆; near M11	6'	18:50.9 -05°12'	9.2
○ NGC6712	GC Bright, large, resolvable	7'	18:53.1 -08°42'	8.2
○ Tr34	OC Unusual shape; strings	8'	18:39.8 -08°29'	8.6
○ Tr35	OC 20☆; compact; near NGC6683	9'	18:42.9 -04°08'	9.2
○ Scutum Star Cloud;	Faint OC inside	3°	18:46.0 -06°30'	—
○ Bas1	OC 12☆; hazy with dim ☆ at 100x; Near R-SCT; nice trapezium surrounds the cluster.	9'	18:48.2 -05°51'	8.9

Serpens *Serpent—Caput/head, Cauda/tail* Summer Aug2 **SER**

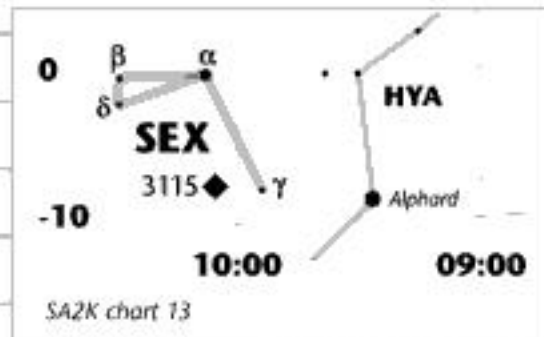
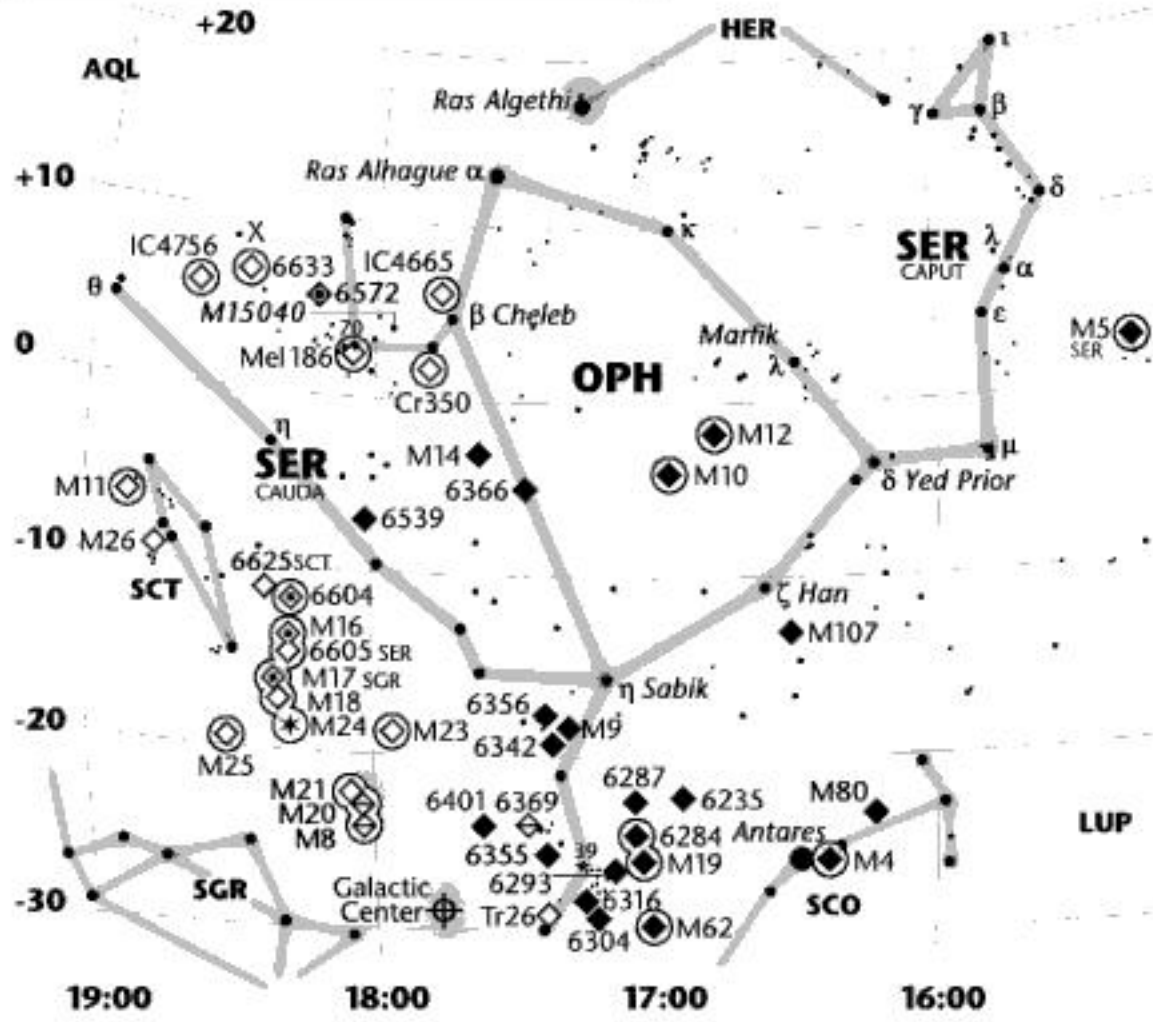
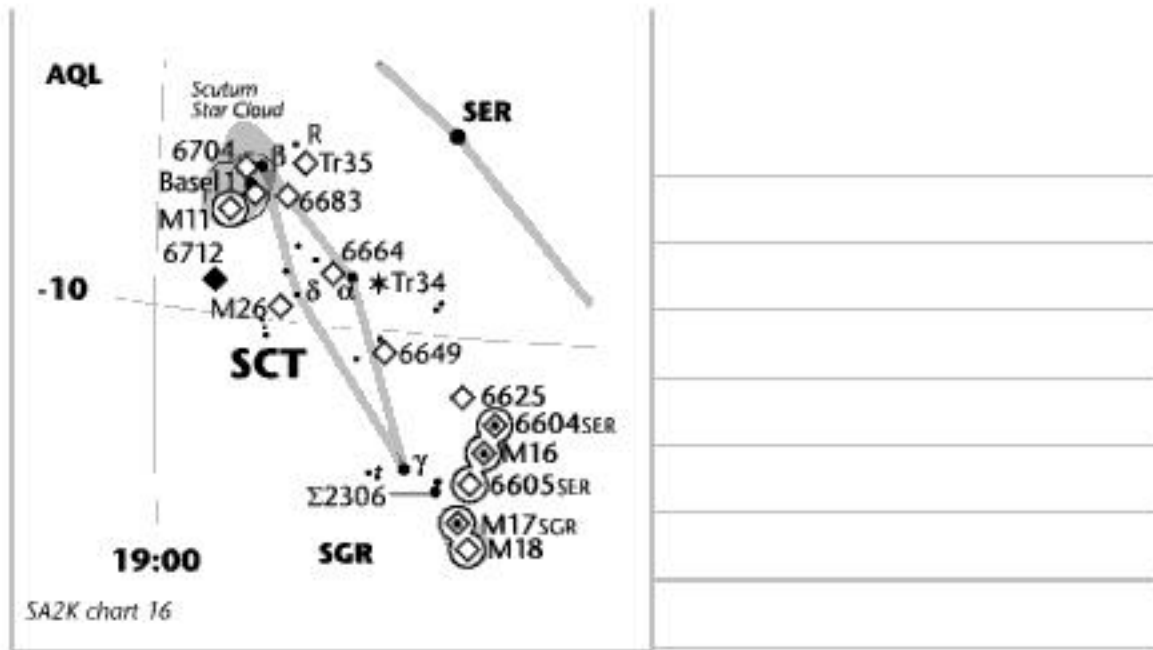
"A long, rambling constellation, mixed with Ophiuchus, it contains some fine telescopic objects."

☆☆ Delta δ	Pale yellow/ashen	3.9"	15:34.5 10°32'	4.2/5
☆☆ Theta θ	Both deep yellow	22.3"	18:56.2 04°12'	4.5/5
○○M5 5904	GC ! Well resolv ; 244☆ mag11+	20'	15:18.6 02°05'	6.1
○○M16 6611	EN ! Eagle Nebula ; dk neb. invol; 60☆ mag8+ surrounded by extensive nebulosity	7'	18:18.6 -13°58'	6.2
○ NGC6539	GC In heavily obscured area	2.5'	18 04.8 -07°35'	9.4
○ NGC6604	C/N Very compressed center	2'	18:18.1 -12°14'	6.5
○ NGC6605	OC Loose open loop; near M16	—	18:18.4 -14°57'	6.0
○○IC4756	OC Large; diffuse; naked eye	40'	18:39.0 05°27'	4.5

Sextans *the Sextant* Spring Apr5 **SEX**

"Formed by Hevelius out of the unused stars lying between the ancient ones."

☆☆ 35	Orange/yellow; split at 100x	6"	10:45.0 -06°00'	5.3-7
○ NGC3115	GC "Spindle"-type; elongated; Very distinct; very bright center; magnifies well.	8x2'	10:05.2 -07°43'	9.0



SCT SER SEX 101

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG

Taurus *the Bull* Winter Jan15 **TAU**

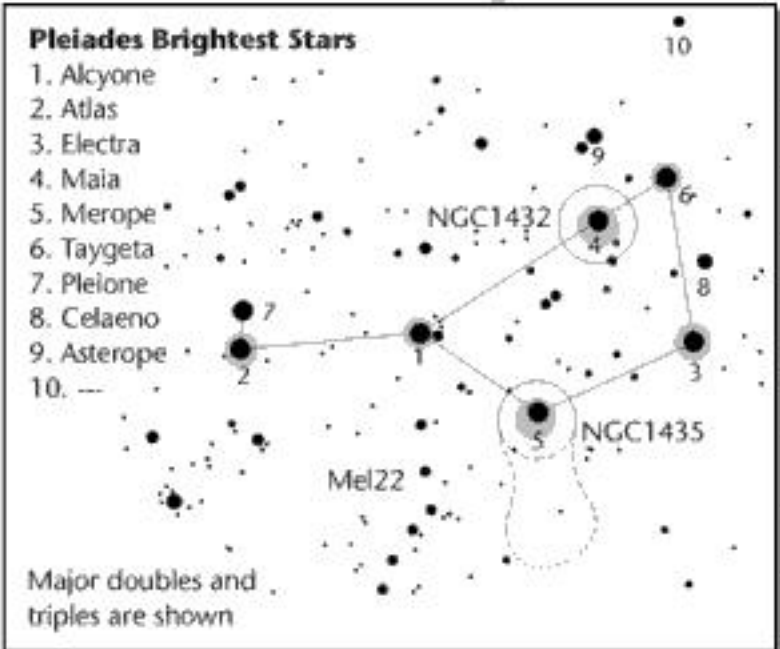
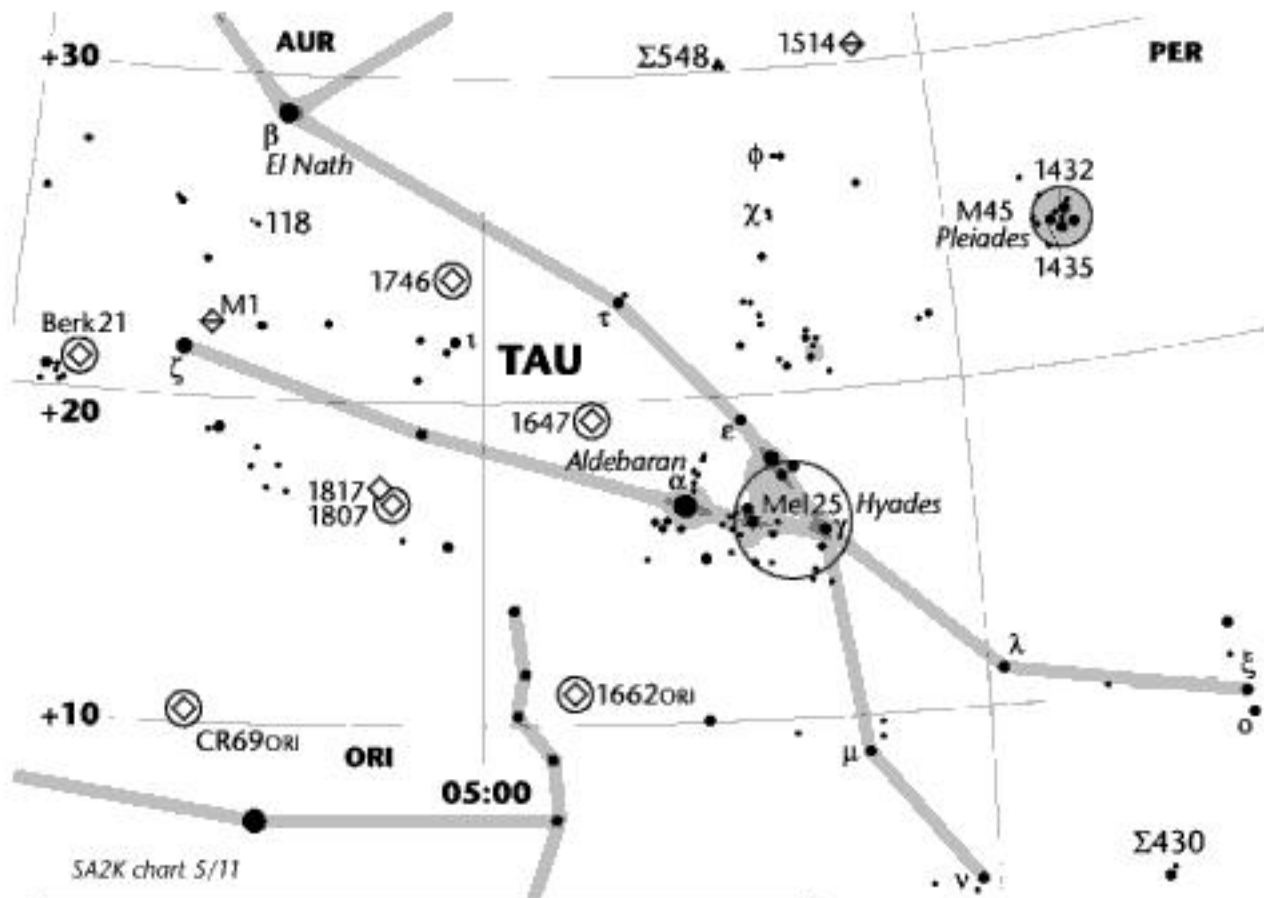
"An interesting constellation containing two beautiful groups familiar to the first beginner in stellar astronomy, The Pleiades, and Hyades. Neither of these, however, is sufficiently concentrated to make a good telescopic object, excepting in an unusually large field."

☆☆	Aldebaran α	Gold/pale red; 68LY	31"	04:36.1	16°31'	.9/11
☆	Alcyone η	Queen Who Wards off Evil Storms; Brightest in Pleiades				2.9
☆☆	Tau τ	White/blue; 510LY	63"	04:42.2	22°57'	5/8.5
☆☆	Phi ϕ	Red-yellow/blue; 110LY	52"	04:20.2	27°21'	5/8.5
☆☆	Chi χ	White/blue	19.4"	04:22.6	25°38'	5.5/8
☆☆	118	☆☆☆; white/yellow/yellow	5"/141"	05:27.0	25°00'	6-7
☆☆	Σ 430	☆☆☆	26"/37"	03:38.0	05°00'	6-10
☆☆	Σ 548	☆☆☆	15"	04:26.0	30°00'	6-10
○	M1 ¹⁹⁵²	SR Crab Neb; oblong; pale; Supernova Remnant; formed 1054, first seen 1751; 6.3MLY.	8.4'	05:34.5	22°01'	8.4
○○	M45 ^{MEL22}	C/N !! Pleiades/Seven Sisters; 380LY; 499☆ to mag14; brilliant naked eye cluster; 3,000 total stars; 13LY wide. Reflection Nebulae.	110'	03:47.0	24°07'	1.2
○	NGC1432	RN Tau-Maia nebula	30'	03:46.0	24°22'	3.9
○	NGC1435	RN Tau-Merope nebula	30'	03:46.3	23°47'	4.2
○	NGC1514	PN 9☆ in 3' diam	1.9'	04:09.2	30°47'	10.5
○○	NGC1647	OC Bright; scattered; 25☆	45'	04:45.9	19°06'	6.4
○○	NGC1746	OC Bright; irreg; 35☆; 2 groups	42'	05:03.6	23°49'	6.1
○○	NGC1807	OC Pretty rich; 15☆ mag 8-9	17'	05:10.7	16°32'	7.0
○○	NGC1817	OC Small spread; 50☆ mag 10-14	16'	05:12.4	16°41'	7.7
○○	Mel25	OC Hyades/the Bull's Face/ Taurus Moving Cluster; closest cluster to earth; 153LY; Aldebaran is not a member of this group.	5.5°	04:20.0	16°00'	0.5
○○	Berk21	OC On sword hand of Orion		05:51.4	21°47'	1.1

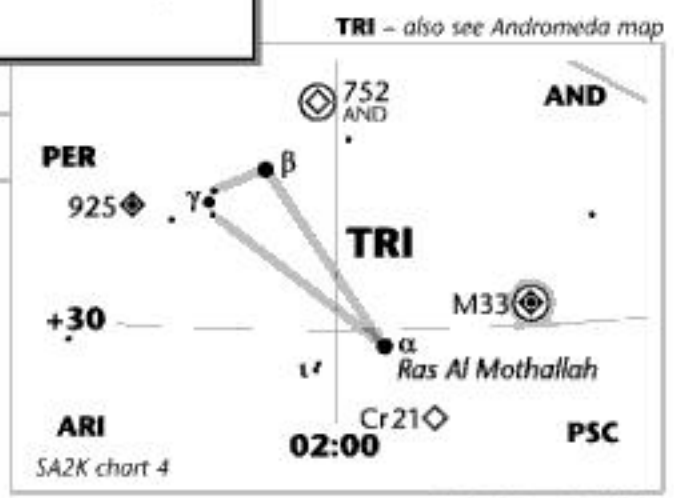
Triangulum *the Triangle* Autumn Dec5 **TRI**

"An ancient constellation, including several good objects."

☆☆	Iota ι	Yellow/blue; beautiful	3.9"	02:12.4	30°18'	5/6.6
○○	M33 ⁵⁹⁸	SG ! Sc; Pinwheel/TRI Galaxy <i>"A very curious object, only fit for low powers."</i> 1/4 size of Milky Way at 45,000LY across; 3MLY; L.	68x10'	01:33.9	30°39'	5.9
○	NGC925	EG Sb-Sc; coarse spiral; Good measure of transparency if seen naked eye; In group with NGC1023-PER.	10x6'	02:27.3	33°35'	10.0
○	Cr21	OC Group of 15☆ Galaxy designations, p.18 L – Member of Local Group	6'	01:50.1	27°15'	8.2



- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ⊕ Cluster w/Nebulosity
 - ◇ ⊕ Nebula
 - ◆ ⊕ Galaxy
- Circle = to mag 7. North is up.



TAU TRI 103

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Ursa Major	<i>the Big Bear, Big Dipper</i>	Spring Apr20	UMA

"Several telescopic objects will require care in their identification."

Numerous galaxies mag10.5-15 in the Big Dipper.

☆☆ Mizar/Alcor ζ	Binoc ☆☆☆; telescopic ☆☆☆☆☆	14.4"	13:23.9	54°58'	2-4
☆☆ Alula Aust. ξ	25LY; binary	2.3"	11:18.2	31°32'	4.4/9
☆☆ 65	☆☆☆	4-63"	11:53.0	47°00'	6.5/8
○ M40 <small>Winecke 4</small>	Ast 2☆☆ with neb?	.8'	12:22.4	58°05'	8.8
○○ M81 <small>3031</small>	SG ! Sa-Sb; <i>Bode's Galaxy</i>	25x10'	09:55.6	69°04'	6.9
○○ M82 <small>3034</small>	IG ! Ip; <i>Cigar Galaxy</i> ; dusty	9x5'	09:55.8	69°41'	8.5
○ M97 <small>3587</small>	PN <i>Owl Neb</i> ; pale; remarkable	3x3'	11:14.8	55°01'	9.8
○ M101 <small>5457</small>	SG Sc; <i>Pinwheel</i> ; faint; 1 hvy arm	28x10'	14:03.2	54°21'	7.8
○ M108 <small>3556</small>	SG Sc; edge-on; near M97	8x2'	11:11.5	55°40'	10.0
○ M109 <small>3992</small>	SG SBb; bright core; barred	7x4'	11:57.6	53°23'	9.8
○ NGC2681	SG S0-Sa; fine, even whorls	2.8x2.5'	08:53.5	51°19'	10.0
○ NGC2768	EG E5; elongated, smooth nebula	8x5'	09:11.6	60°02'	9.9
○ NGC2841	SG ! Sb; dusty; classic elong.	8x4'	09:22.0	50°58'	9.3
○ NGC2976	IG Irr; rich; cond; neb.; 50☆☆	6x3'	09:47.2	67°55'	9.5
○ NGC3077	IG Irr; near M81; dusty streamers	5x5'	10:03.3	68°44'	9.8
○ NGC3184	SG Sc; diffuse knots; halo; face-on	7x7'	10:18.3	41°25'	9.7
○ NGC3310	SG Irr-Sc; round; bright core	4x3'	10:35.7	53°30'	10.0
○ NGC3941	SG E3-S0; round hub; nebulosity	4x3'	11:52.9	36°59'	9.8
○ NGC3953	SG SBb; bright, elliptical, no core	7x3.5'	11:53.8	52°20'	10.0
○ NGC4605	SG Scp; bright; distinct; edge-on	7x2.5'	12:40.0	61°37'	9.6
○ NGC5322	EG E2-E3; round; smooth nucleus	6x4'	13:49.2	60°11'	10.0
○ STAR-19	Ast <i>Broken Engagement Ring</i>	20'	10:51.0	56°09'	—
○○ Cr285	OC UMA moving cluster	25°	12:03.0	58°00'	0.4

Ursa Minor	<i>Little Bear, Little Dipper</i>	Spring Jun25	UMI
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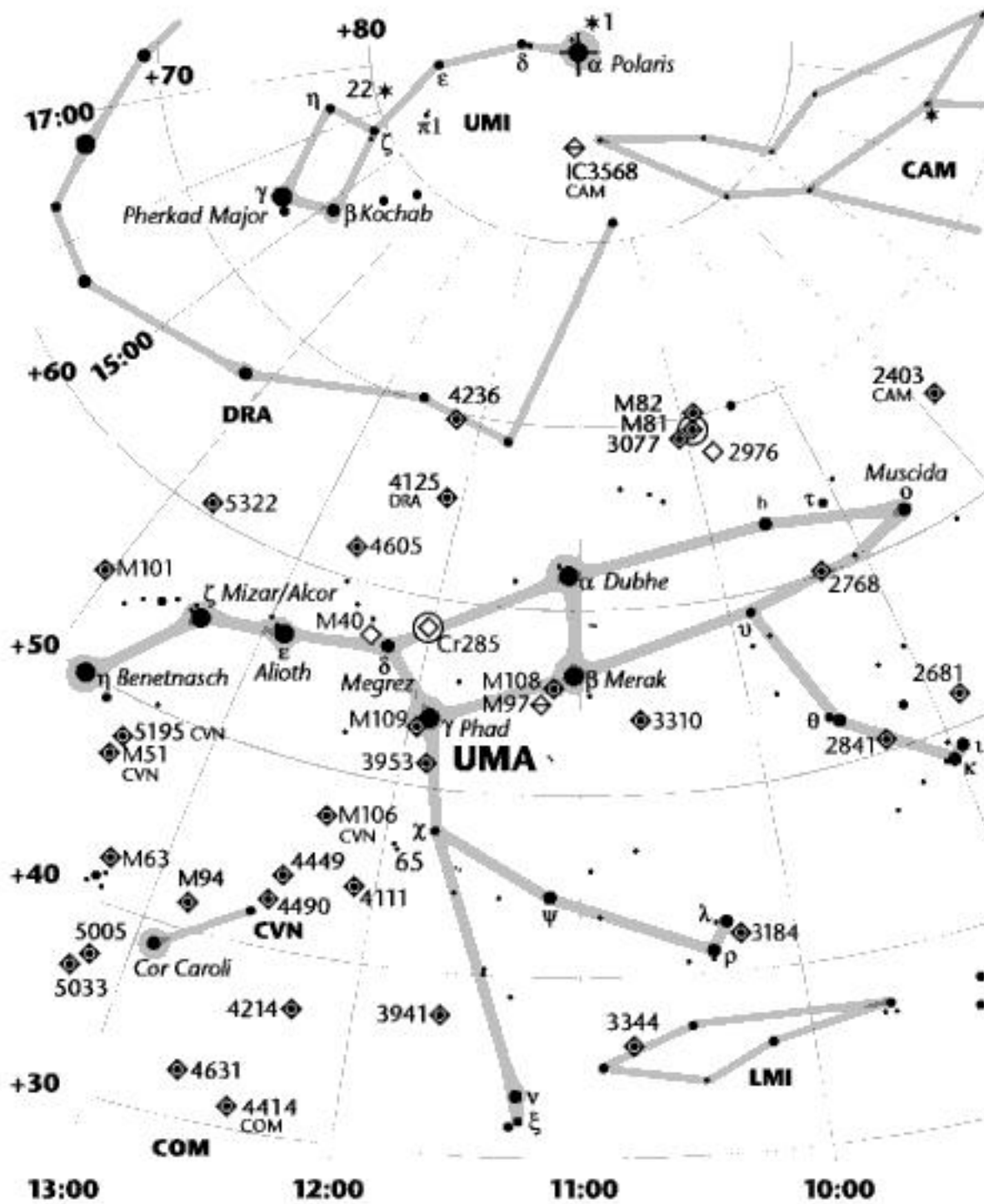
"Polaris was 1°7' from the polar point in 1859; will be close as 26'30" in 2095."

☆☆ Polaris α	Pale yellow/blue	18.4"	02:31.8	89°16'	2/9
	<i>North Star/Pole Star/Stella Polaris</i> ; Cepheid variable.				
☆☆ Pi 1 π'	Pale yellow/blue	31"	02:31.8	90°00'	6.5/9
○ STAR-1	Ast <i>Diamond Ring</i>	45'	02:32.0	89°00'	—
○ STAR-22	Ast <i>Mini-Coathanger</i>	15'	16:29.0	80°13'	—

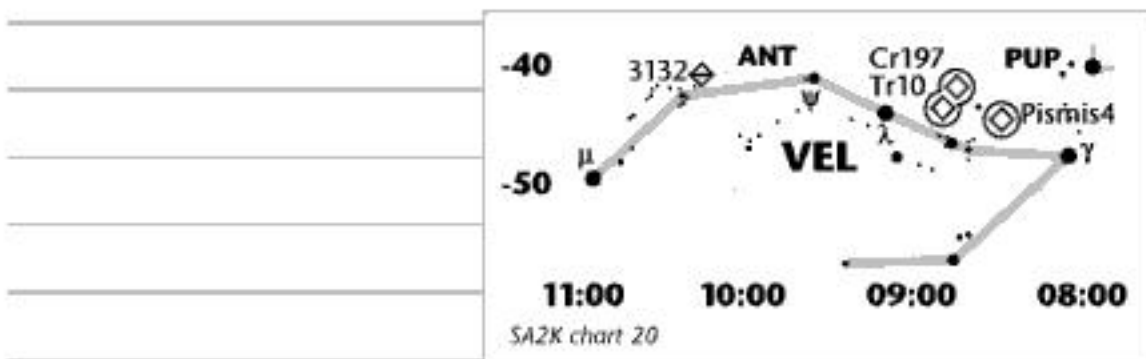
Vela	<i>Sail of the Argonaut's Ship</i>	Spring Mar25	VEL
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○ NGC3132	PN <i>8-Burst Planetary</i> ;	1.4'	10:07.0	-40°26'	8.1
	Very bright; actual center ☆ is mag15.8.				
○ Cr197	OC Few ☆s in nebulous region	17'	08:44.7	-41°22'	6.7
○ Tr10	OC 12 ☆s; many smaller	15'	08:47.8	-42°29'	4.6
○ Pismis4	OC Club shape, ☆☆ and neb. inv.	18'	08:34.5	-44 16'	5.9

Galaxy designations, p.18



SA2K chart 2/6



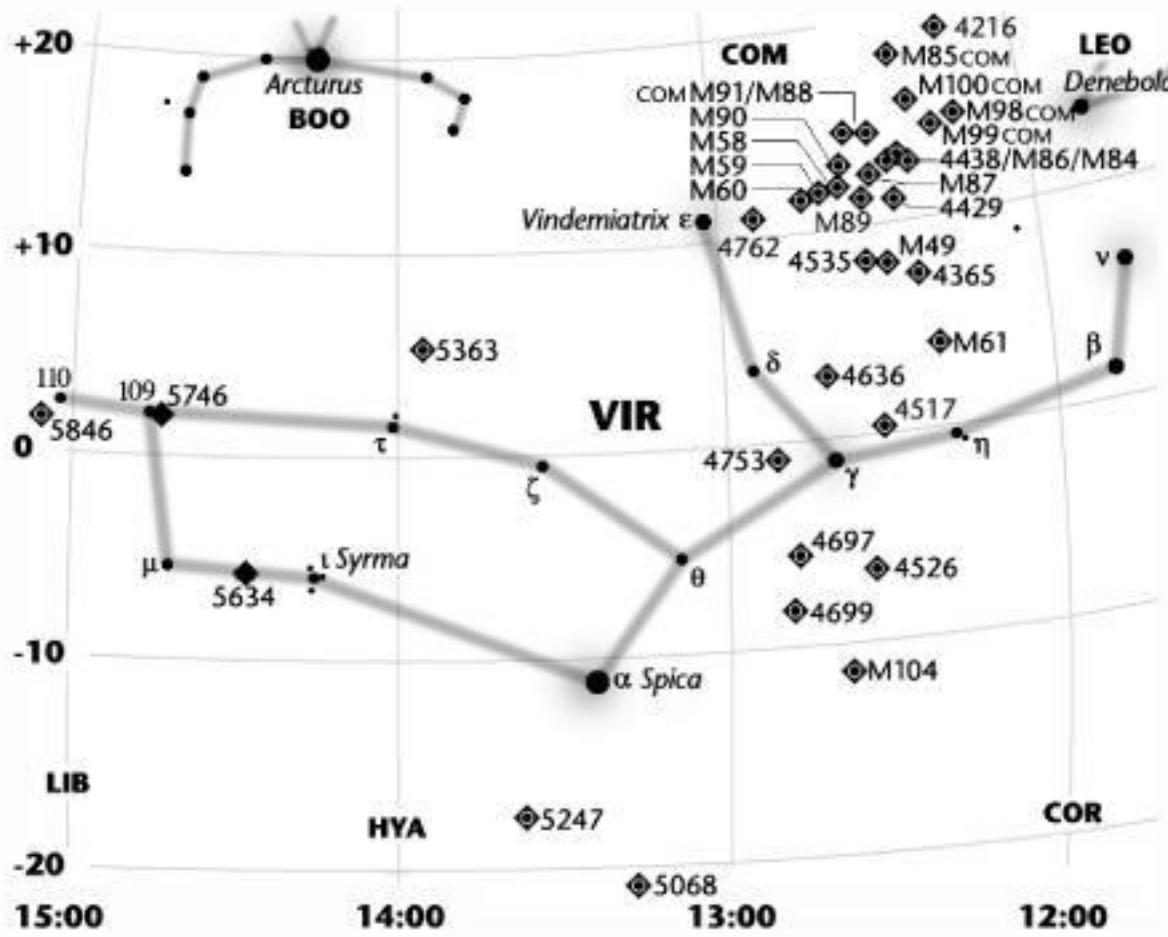
SA2K chart 20

UMA UMI VEL 105

Objects in the Heavens

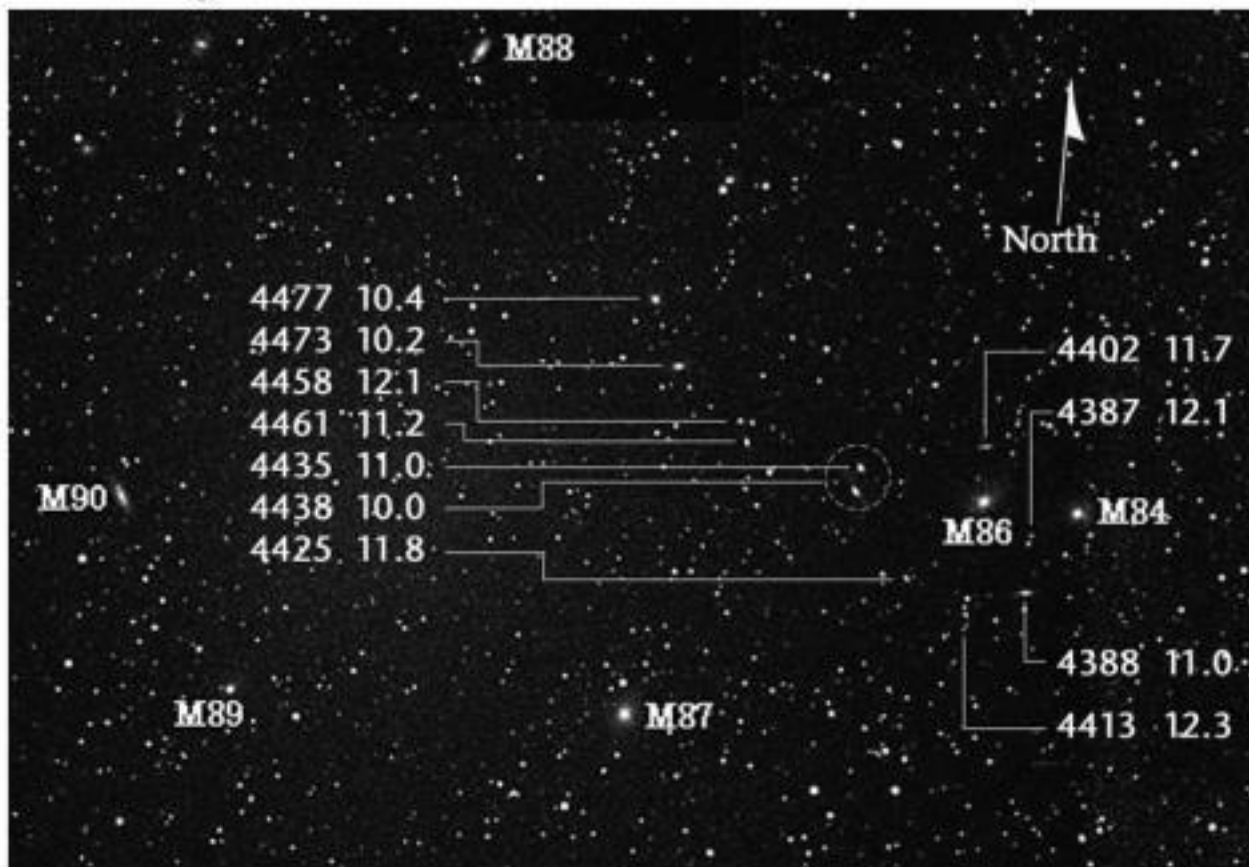
CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA DEC	MAG
Virgo	<i>the Virgin, the Maiden</i>	Spring May25	VIR
"A constellation remarkable for the wonderful nebulous region, in which a far greater number are accumulated than in any other equal area of the heavens."			
See Coma Berenices for other objects in field with M84-M90.			
☆ Spica	α Eclipsing variable, 4 days; Blue super giant; 262LY; 1,300x brighter than sun.	13:25.2 -11°10'	.96-1.05
☆☆ Porrima	γ Fine binary was 3.5" sep, now 0.35"	12:41.7 -01°27'	3.6
☆☆ Theta	θ ☆☆☆, white/violet/gray	7"/72" 13:09.9 -05°32'	4-10
☆☆ Tau	τ Optical double; easy	80" 14:01.6 01°33'	4/9
○ M49 ⁴⁴⁷²	EG E2; round; bright core	10x9' 12:29.8 08°00'	8.3
○ M58 ⁴⁵⁷⁹	SG Sb; round; bright core; compact	6x5' 12:37.7 11°49'	9.2
○ M59 ⁴⁶²¹	EG E3-E4; elongated; bright core	5x4' 12:42.0 11°39'	9.6
○ M60 ⁴⁶⁴⁹	EG E1-E2; round; bright core	8x6' 12:43.7 11°33'	8.8
○ M61 ⁴³⁰³	SG Sc; bright spiral; 60MLY	6.5x6' 12:21.9 04°28'	9.8
○ M84 ⁴³⁷⁴	EG E1; face-on; bright core	6' 12:25.1 12°53'	9.1
○ M86 ⁴⁴⁰⁶	SG E3; round; bright core	10x6' 12:26.2 12°57'	9.0
○ M87 ⁴⁴⁸⁶	EG E0-1; <i>Virgo A/Smoking Gun</i> ; Round; bright core; powerful radio source; center of ~3,000 galaxies.	9x7' 12:30.8 12°24'	8.8
○ M89 ⁴⁵⁵²	EG E0; round; bright core	5x4' 12:35.7 12°33'	9.5
○ M90 ⁴⁵⁶⁹	SG Sb; well-formed oval; bright core	9x4' 12:36.8 13°10'	9.4
○ M104 ⁴⁵⁹⁴	SG Sa; <i>Sombrero Galaxy</i> ; edge-on; 28MLY; larger equipment can see dust lane.	9x4' 12:40.0 -11°37'	8.0
○ NGC4216	EG Sb; edge-on; 4206/22 nearby	8x2' 12:15.9 13°09'	9.9
○ NGC4365	EG E2-E3; in dim group WSW of M49	7x5' 12:24.5 07°19'	9.8
○ NGC4429	SG S0-Sa; large outer ring	6x3' 12:27.4 11°06'	10.0
○ NGC4438	SG Sap; <i>The Eyes</i> ; resolvable	9x3' 12:27.8 13°01'	10.0
○ NGC4517	SG Sc; 'Finest' edge-on	10x2' 12:32.8 00°07'	10.5
○ NGC4526	EG E7-S0; <i>The Lost Galaxy</i> ; Very bright core; on edge; between 2☆ mag 7.	8x3' 12:34.0 -07°42'	9.6
○ NGC4535	SG SBc; face-on, S-shaped	7x5' 12:34.3 08°12'	9.9
○ NGC4636	EG E1; round; brighter core	5x4' 12:42.8 02°41'	9.5
○ NGC4697	EG E5; elongated; bright core	7x4.6' 12:48.6 -05°48'	9.2
○ NGC4699	SG Sa-Sb; elongated; bright core	3x3' 12:49.0 -08°40'	9.5
○ NGC4753	EG Ep; elongated; bright core	5x2.5' 12:52.4 -01°12'	9.9
○ NGC4762	SG S0-SBa; flattest known spiral	9x2' 12:52.9 11°14'	10.2
○ NGC5068	SG SBc; coarse spiral, dim	7x6' 13:18.9 -21°02'	10.0
○ NGC5247	SG Sb-Sc; fine S-shape double arm	5x5' 13:38.0 -17°53'	10.0
○ NGC5363	EG Irr-Ep; suddenly brighter middle	4.2' 13:56.1 05°15'	10.0
○ NGC5634	GC Unresolved; bright core	4.9' 14:29.6 -05°59'	9.4
○ NGC5746	GC Edge-on; faint; elusive	6x8' 14:44.9 01°57'	10.4
○ NGC5846	EG E0; brightest of dim group	4x4' 15:06.5 01°36'	10.0

Galaxy designations, p.18



SA2K chart 14

Markarian's Chain (NGC4374): M88 curving to M84, in the Virgo Cluster or "Realm of the Galaxies".



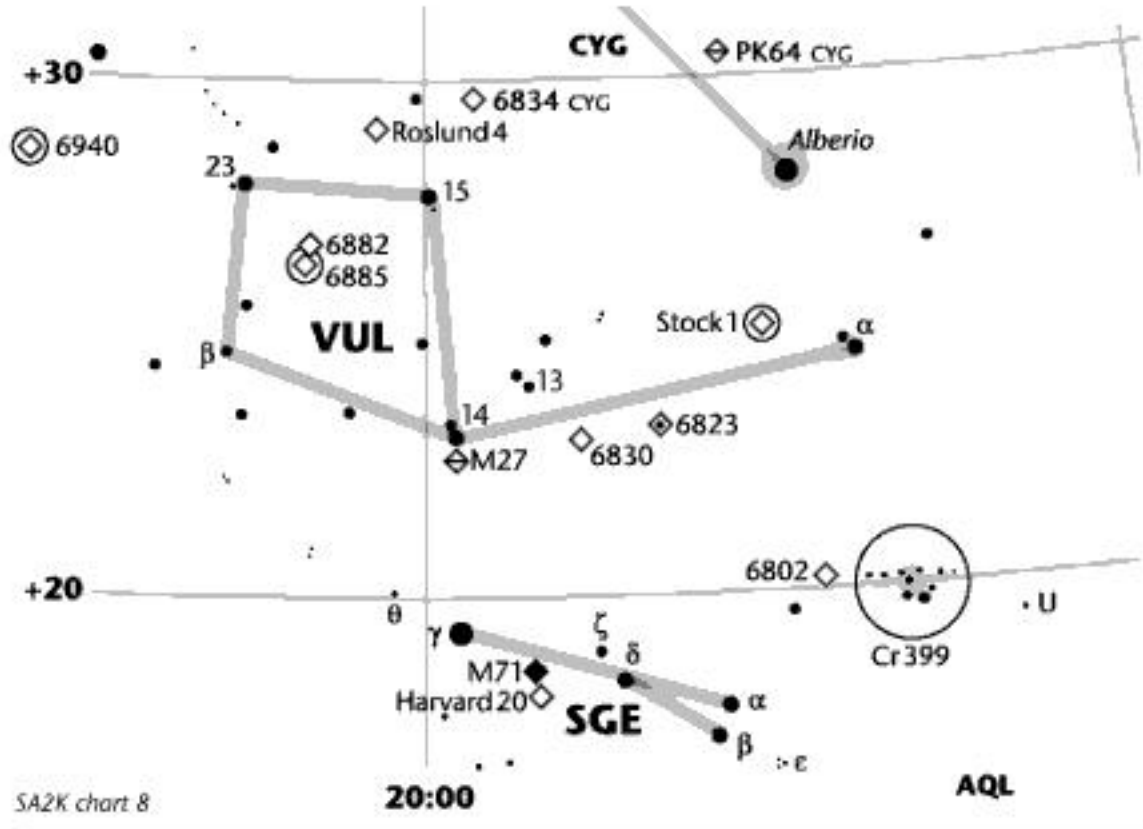
VIR 107

Objects in the Heavens

CONSTELLATION	COMMON NAME	SEASON, ON MERIDIAN	ABBREVIATION
ITEM IDENTIFIER	TYPE DETAILS	SIZE RA	DEC MAG
Vulpecula	<i>the Fox</i>	Summer Sep10	VUL
<i>"Grand sweeping; few coloured stars. Dumbbell will not be disappointing."</i>			
OO M27 ⁶⁸⁵³	PN ! <i>Dumbbell Nebula</i> ; 1,250LY	7' 19:59.6 22°43'	7.4
O NGC6802	OC East end of Brocchi's Cluster	3' 19:30.6 20°16'	8.8
OO NGC6823	C/N Large; rich; compressed; 30☆	12' 19:43.2 23°18'	7.1
O NGC6830	OC Diamond in a box; 20☆	8' 19:51.0 23°06'	7.9
O NGC6882	OC Sparse cluster	18' 20:11.9 26°40'	8.5
O NGC6885	OC Bright; rich; 35☆ mag6-11 NGC6882 + 6885 make interesting 3D effect.	7' 20:11.9 26°29'	6.5
OO NGC6940	OC Binoc Cluster; 100☆; rich	31' 20:34.6 28°18'	6.3
OO Cr399	Ast ! <i>Brocchi's Cluster/Coathanger</i> ; Excellent binocular display for first-time viewers.	60' 19:25.4 20°11'	3.5
OO Stk1	OC 70☆; easy in binoculars	80' 19:35.8 25°13'	5.3
O Ros4	OC Tiny double cluster in rich field	6' 20:04.9 29°13'	10.0

M27-VUL, The Dumbbell Nebula ... The Apple Core Nebula





SA2K chart 8

- ◇ ○ Open Cluster
 - ◆ ● Globular Cluster
 - ◇ ⊗ Cluster w/Nebulosity
 - ◇ ⊕ Nebula
 - ◆ ⊕ Galaxy
- Circle = to mag 7. North is up.

WEBSITE RESOURCES

AAVSO - Variable Star Observers	AAVSO.ORG
ALPO - Lunar/Planetary Observers	LPL.ARIZONA.EDU/ALPO
Amer. Ass'n of Amateur Astronomers	CORVUS.COM
American Meteor Society	AMSMETEORS.ORG
Astronomical Data Sources	TDC-WWW.HARVARD.EDU/ASTRO.HTML
Astronomical League	ASTROLEAGUE.ORG
Astronomy links	ASTRONOMYLINKS.COM/
Astronomy Picture of the Day	ANTWRP.GSFC.NASA.GOV/APOD/
Author's Portfolio	BIRRENDESIGN.COM
Bad Astronomy	WWW.BADASTRONOMY.COM
Chart program (free) Hallo	WWW.HNSKY.ORG/SOFTWARE.HTM
Chart program (free) Cartes du Ciel	WWW.STARGAZING.NET/ASTROPC/
Charts, monthly (free)	SKYMAPS.COM/
Comet Observation Home Page	ENCKE.JPL.NASA.GOV/
Comets and Meteor Showers	COMETS.AMSMETEORS.ORG/INDEX.HTML
Deepsky Observers Companion	FORTUNECITY.COM/ROSWELL/BORLEY/49/
Double Star Observing	WWW.FVASTRO.ORG/JS_DOUBLE.HTM
Hawaiian Astronomical Society	HAWASTSOC.ORG
Heavens Above - satellites	WWW.HEAVENS-ABOVE.COM/
Int'l Dark Sky Association	WWW.DARKSKY.ORG
JPL/NASA Space Calendar	WWW.JPL.NASA.GOV/CALENDAR/
NASA/IPAC Extragalactic Database	NEDWWW.IPAC.CALTECH.EDU/FORMS/BYNAME.HTML
Naoyuki Korita, astrophotography	KURITA.HOTSPACE.JP/INDEX_E.HTM
National Geographic Chart	NATIONALGEOGRAPHIC.COM/FEATURES/97/STARS/CHART/INDEX.HTML
NGC/IC Project	NGCIC.ORG
Peoria Astronomical Society	ASTRONOMICAL.ORG
Planetary Society	PLANETARY.ORG
Planets and astro mythology	WWW.WINDOWS.UCAR.EDU
The Nine Planets	WWW.NINEPLANETS.ORG
Royal Astro. Society of Canada	WWW.RASC.CA/OBSERVE.HTM
Saguaro Astronomy Club	SAGUAROASTRO.ORG
SEDS Astronomy Resource	WWW.SEDS.ORG
Sky Insight - News, forums, tools	SKYINSIGHT.NET/
Small Telescope Viewing	GEOCITIES.COM/THE_150MM_REFLECTOR
Solar System Ambassaer	WWW.JPL.NASA.GOV/AMBASSADOR
Solar System Simulator	SPACE.JPL.NASA.GOV/
StarDate - Nice site for beginners	STARDATE.ORG
Stargazer Home (links and more)	WWW.STARGAZING.COM
STScI Digitized Sky Survey	STDATU.STSCI.EDU/CGI-BIN/DSS_FORM
SWAOG, Chicago ham radio group	WWW.SWAOG.COM
Telescope Advice for Beginners	WWW.SCOPEREVIEWS.COM/BEGIN.HTML
Telescope Making	HOME.ATTBI.COM/~DCASS/ATMFAQ/
Telescope Reviews	WWW.CLOUDYNIGHTS.COM/
Tonight's Sky - Daily sky items	WWW.EARTHSKY.COM/FEATURES/SKYWATCHING/
The Universe, an atlas	WWW.ANZWERS.ORG/FREE/UNIVERSE/
US Hang Gliding Association	USHGA.ORG

Objects in the Heavens

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Spend more time viewing and less time searching.

*Peter Birren is an awarded graphic designer, avid amateur astronomer, accomplished inventor and long-time hang glider pilot. **Keep looking up!***

www.BirrenDesign.com

This is a very useful book. I have no hesitation in recommending it to those who are just starting out in deep sky observing and/or have small **telescopes or binoculars**. I would certainly have appreciated this little book when I started in deep-sky.

*Faith Jordan
Webb Society, UK*

Your book is perfect for use with my go-to LX-90. I know my constellations... now I spend more quality viewing time in each.

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