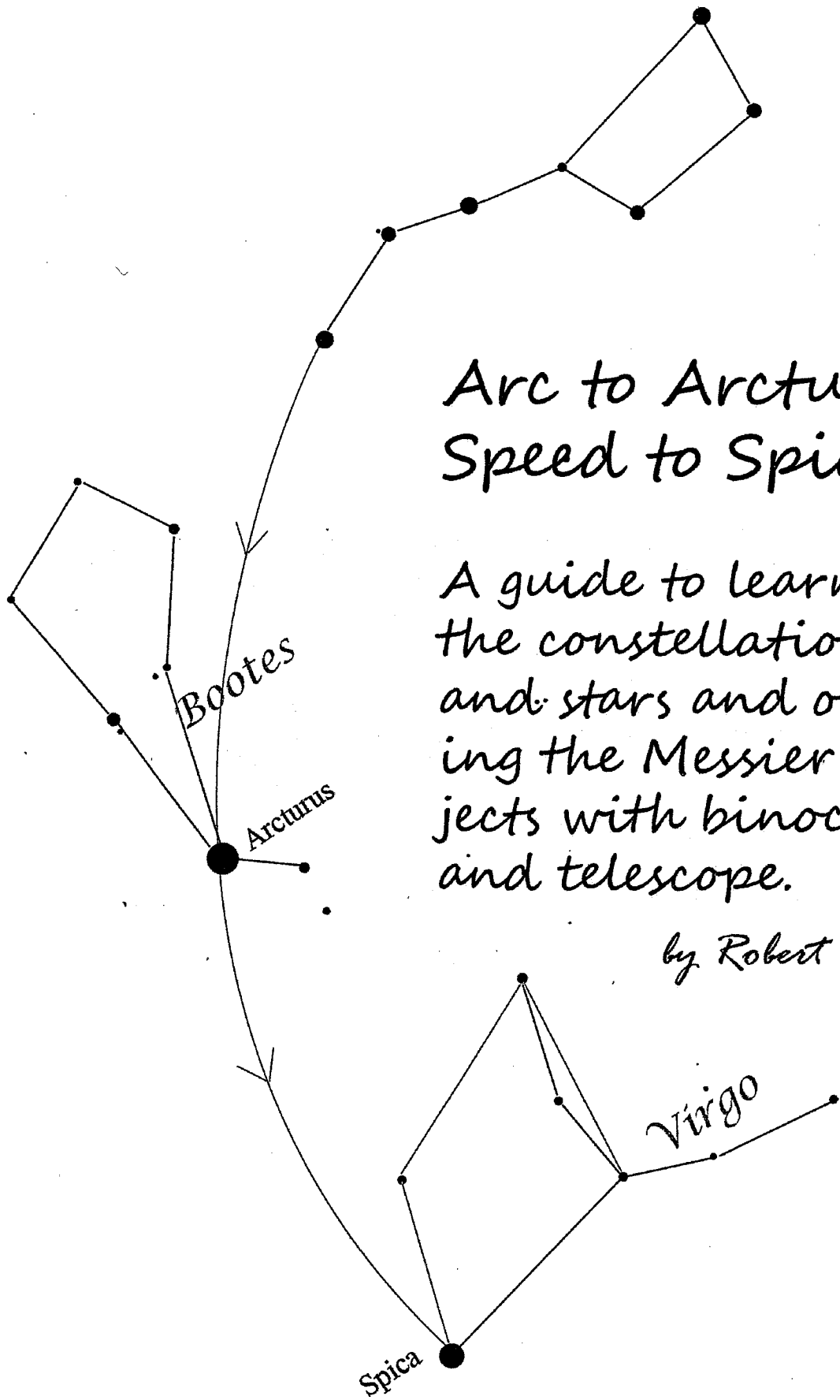


Arc to Arcturus, Speed to Spica

A guide to learning the constellations and stars and observing the Messier objects with binoculars and telescope.

by Robert Togni

Preface

The purpose of this book is to help you become better acquainted with the night sky and to incite you to want to learn more about this part of our universe. Astronomy began thousands of years ago when ancient people looked up and wondered about the movements in the heavens. Without telescopes or even binoculars they established the constellations, understood the motions of the stars, the dance of the planets, and even predicted eclipses. We still use their names for most of the constellations and sometime recall the stories they told.

Much pleasure is derived from learning to name the constellations, bright stars, and watching the progression of the seasons. With this knowledge add binoculars and a telescope to view far off galaxies, dense globulars, exploded stars, not to mention the planets and the moon.

Using This Atlas

This atlas is meant to be used with a red light and binoculars under the sky. It is divided into sections of the sky such as the Summer Triangle and Winter Hexagon. Plan your first night. Choose your season and read through the descriptions and objects you can see. Note the initial paragraphs for each section that gives easily identified objects such as the Big Dipper or Orion's belt to start with. Start developing your map memory by memorizing some of the key stars names and constellations. Note the objects you would like to view with binoculars. When out under the night sky, trace out the constellations and asterisms (i.e. Summer Triangle). Start logging the objects you see especially with binoculars.

This atlas includes primary stars for the constellations and enough dim stars to use binoculars to find the objects listed. It's purpose is to help you learn the constellations and bright stars. Learn to star hop to interesting objects including the Messier objects. It is broken into areas of the sky chosen by the stars instead of typical sections of maps based on Right Ascension and Declination. You'll find when you know the stars it will be much easier to use the more comprehensive atlases.

The dates given for each chart reference culmination about 9 pm. Culmination is when a star crosses the Meridian. The meridian is a line drawn from due north to due south, representing the highest altitude for every star.

Basic Sky Motions

The stars rise in the east and set in the west. For the northern hemisphere the farther north the stars are, the longer they stay up. That is why the days are longer when the sun is in the northern part of the ecliptic. The planets, sun, and moon move in the plane called the ecliptic. If you see a sojourner near the ecliptic it is most likely a planet.

Bayer Designation

In 1603 Johannes Bayer used Greek Letters in his star Atlas Urananometria to signify the bright stars in a constellation. He used Alpha for the brightest star, Beta for the next brightest and so on. With no precise measurement techniques, changing stars, etc. this is not always true. For example in 30 of the 88 modern constellations "Alpha" is not the brightest star and in several there is no alpha star when more modern constellations have been created.

Symbols	Name	Symbol	Name	Symbol	Name	Symbol	Name
Α α	alpha	Θ θ	theta	Ο ο	omicron	Χ χ	chi
Β β	beta	Ι ι	iota	Π π	pi	Ψ ψ	psi
Γ γ	gamma	Κ κ	kappa	Ρ ρ	rho	Ω ω	omega
Δ δ	delta	Λ λ	lambda	Σ σς	sigma		
Ε ε	epsilon	Μ μ	mu	Τ τ	tau		
Ζ ζ	zeta	Ν ν	nu	Υ υ	upsilon		
Η η	eta	Ξ ξ	xi	Φ φ	phi		

Maps and Constellations	
1. Circumpolar	Ursa Major, Ursa Minor, Cassiopeia, Cepheus, Draco, Camelopardalis
2. Winter Hexagon	Taurus, Auriga, Orion, Gemini, Canis Major, Canis Minor, Monoceros, Lepus, Puppis, Eridanus
3. Virgo Cluster	Virgo, Coma Berenices
4. Spring Diamond	Bootes, Virgo, Leo, Canes Venatici, Ursa Major
5. Spring Diamond Extended	Corona Borealis, Leo Minor, Lynx, Cancer, Corvus, Crater, Hydra, Libra, Sextans
6. Summer Triangle	Lyra, Cygnus, Aquila, Scutum, Vulpecula, Sagitta, Delphinus, Hercules, Lacerta
7. Summer Ecliptic	Scorpius, Sagitarius, Ophiuchus, Serpens Caput and Cauda, Corona Australis
8. Fall Square	Pegasus, Perseus, Andromeda, Pisces, Cetus, Triangulum, Aries,
9. Watery Ecliptic	Capricorn, Aquarius, Pisces Austrinus, Equuleus

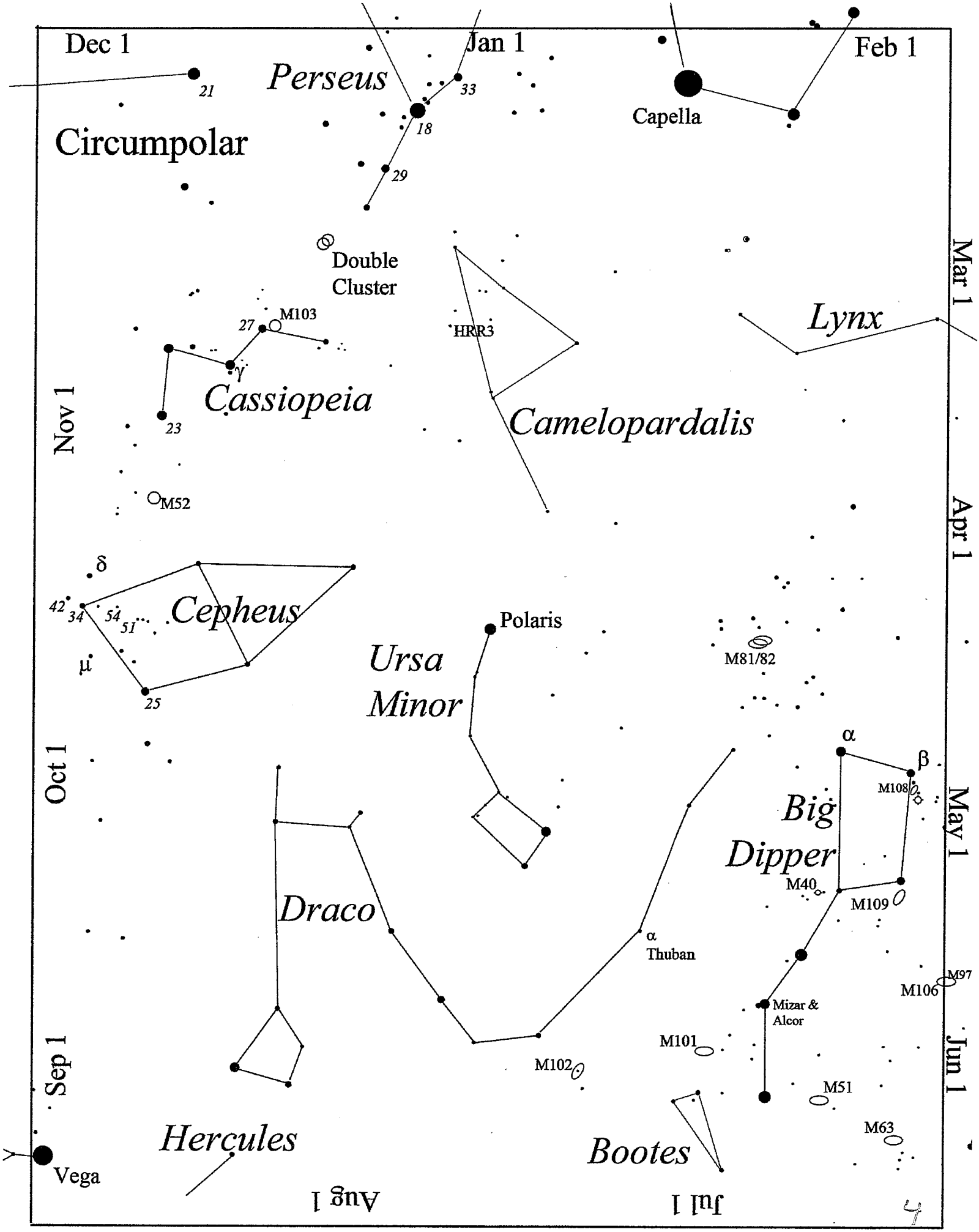
Star Magnitudes

The brightness of a star is referred to as it's magnitude. Apparent magnitude is the brightness of the star as seen by an observer on earth. Absolute magnitude is the standard brightness of a star if it were 10 parsecs or about 32.6 light years from earth. This document discusses apparent magnitudes only.

The magnitude scale we use was developed by either Hipparchus or Ptolemy about 2000 years ago. Vega is the standard zero magnitude star and the dimmest stars we can see without optical aid are about 6th magnitude (on a dark, clear moonless night out of artificial lighting).

Make an effort to learn the 1st magnitude stars and important 2nd magnitude stars. Following is a list of the top 26 stars and their magnitudes.

	Name	Mag	Bayer Designation	Dist (LY)			Name	Mag	Bayer Designation	Dist (LY)
1	Sirius	-1.46	α CMa	8.6		14	Aldebaran	.85v	α Tau	65
2	Canopus	−0.72	α Car	310		15	Spica	1.04	α Vir	260
3	Alpha Centauri	−0.27	α Cen	4.4		16	Antares	1.09v	α Sco	600
4	Arcturus	−0.04v	α Boo	37		17	Pollux	1.15	β Gem	34
5	Vega	0.03	α Lyr	25		18	Fomalhaut	1.16	α PsA	25
6	Capella	0.08	α Aur	42		19	Deneb	1.25	α Cyg	2600
7	Rigel	0.12	β Ori	860		20	Beta Cru	1.3	β Cru	350
8	Procyon	0.34	α CMi	11		21	Regulus	1.35	α Leo	77
9	Betelgeuse	0.42 v	α Ori	640		22	Adara	1.51	ε CMa	430
10	Achernar	0.50	α Eri	140		23	Castor	1.58	α Gem	52
11	Beta Centauri	0.60	β Cen	350		24	Shaula	1.62	λ Sco	700
12	Altair	0.77	α Aql	17		25	Bellatrix	1.64	γ Ori	240
13	Alpha Crucis	.77	α Cru	320		26	Elnath	1.68	β Tau	130
v Variable Star										


Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Perseus
21
33
18
29
Capella
Circumpolar
Double
Cluster
M103
27
γ
23
Cassiopeia
HRR3
Camelopardalis
Lynx
M52
δ
42
34
54
51
Cepheus
μ
25
Polaris
Ursa
Minor
M81/82
α
β
M108
Big
Dipper
M40
M109
Draco
α
Thuban
M97
M106
Mizar &
Alcor
M101
M102
M51
M63
Hercules
Bootes
Vega

Circumpolar Chart—North

In the northern hemisphere we are very fortunate to have a star close to the pole. All stars rotate around the North Star (Polaris) because of the rotation of the earth. When the Big Dipper is up it is easy to find the North Star using Alpha and Beta, the pointer stars. When not up, Cassiopeia is up and while there are no pointers, it is easy to establish a relationship between Cassiopeia and the North Star.

Orientation: At 9 pm in the evening find the current date around the edge of the chart. Put this at top of chart for correct orientation of chart to sky. Subtract one month for each 2 hours before nine and add one month for each 2 hours after nine.

The Big Dipper

The **Big Dipper asterism** is part of the constellation Ursa Major. Actually the dipper is a cluster with most of the stars moving with one another. See the Spring Diamond Extended for the rest of Ursa Major including some Messier's.

Mizar & Alcor was an ancient test of eye sight for the Arabians if they could see both. Mizar the brightest is actually a beautiful double through a small telescope.

M40 is a double star. Messier added it to his catalog when searching for a Nebula recorded by Johann Hevelius. Sep 51.7" Mag 9.6 & 10.1.

M81 Bode's Nebula is a spiral galaxy visible in binoculars.

M82 the **Cigar Nebula** companion of M81 is an edge on spiral.

M97 the Owl Nebula is a planetary nebula that displays its Owl Eyes through a 10" Scope.

M101 the Pinwheel Galaxy is a spiral galaxy visible in Binoculars.

M108 is an edge on Barred Spiral Galaxy best viewed through a scope.

M109 Messier 109 is a barred spiral galaxy about magnitude 11 southeast of the star Phecda (γ UMa).

Camelopardalis the Giraffe

An inconspicuous constellation created in modern times. Has a few stars shining at 4th magnitude.

HRR3 nice binocular string of stars called Kemble's Cascade.

Cassiopeia the Queen

Distinctive W shape in the Milky Way. Located in the Milky Way it is a fine area for sweeping with binoculars.

Gamma Cas is an eruptive variable star, whose brightness changes irregularly between +2.15 mag and +3.40 mag. It is the prototype of the class of Gamma Cassiopeiae variable stars. The apparent magnitude of this star was +2.2 in 1937, +3.4 in 1940, +2.9 in 1949, +2.7 in 1965 and now it is +2.15.

M103 is a distant open cluster that is about magnitude 7.5 visible in Binoculars.

M52 is another distant open clust of about magnitude 7.

Cepheus the King

Shaped like a house and not as bright as Cassiopeia, Cepheus was Cassiopeia's husband and Andromeda's father.

Delta Cephei is the star an important class of variable stars is named after. The period of Cepheids can be directly related to their brightness. Cepheids are used to determine the distance to star clusters and other galaxies. Delta Cephei varies from 3.5 to 4.4 over a period of about 6 days. Close stars for comparison show magnitudes like *42* (without decimal). Use these to estimated Delta Cephei's brightness.

Mu Cepheus is known as Hershcel's Garnet Star. It is one of the reddest stars visible in binoculars. It varies from 3.4 to 5.1 over a period of about 730 days. Note comparison stars shown on map.

Draco the Dragon

Fun to trace out with it's head near Hercules.

Thuban was the North Star when the Pyramid's were built about 5000 years ago.

M102 the Spindle Galaxy is an 11th magnitude spiral or lenticular galaxy. Best viewed through a scope.

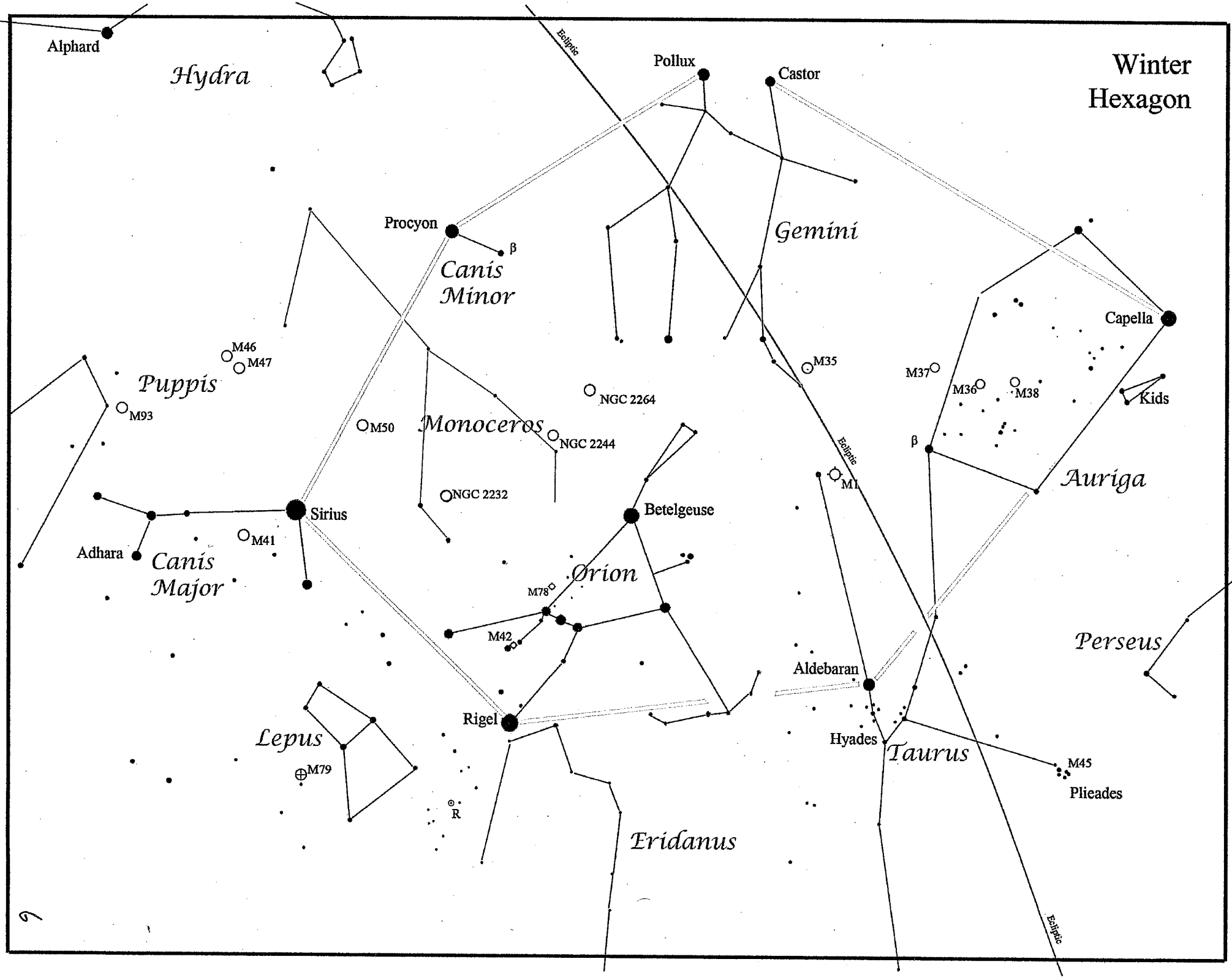
Ursa Minor the Lesser Bear

The **Little Dipper** requires dark skies to see all 7 stars. The star at the end of the handle is Polaris the north star.

Polaris the North Star is a 2nd magnitude star. Through a scope it has a dim companion. Located close at the North Celestial Pole it stays stationary.

Perseus

See Perseus on the Fall Square Chart


Winter Hexagon
Alphard
Hydra
Ecliptic
Pollux
Castor
Procyon
β
Canis Minor
Gemini
Capella
M46
M47
Puppis
M93
M35
M37
M36
M38
Kids
NGC 2264
M50
Monoceros
NGC 2244
β
Ecliptic
M1
Auriga
NGC 2232
Sirius
Betelgeuse
Adhara
M41
Canis Major
Orion
M78
M42
Perseus
Aldebaran
Rigel
Lepus
Hyades
Taurus
M45
Pleiades
M79
R
Eridanus
Ecliptic

Winter Hexagon—Page 1

Visible Jan to April in the evenings

The brightest area of the sky is the Winter Hexagon with 9 first magnitude stars. Start by locating Orion's belt. Follow the belt to the east to find Sirius, the brightest star, and to the west to red Aldebaran in Taurus. Use the chart to complete the Hexagon, including Procyon, Castor, Pollux, Capella, and Rigel. Included in the Winter Hexagon is another popular Asterism the Winter Triangle made up of Sirius, Betelgeuse, and Procyon.

Orion the Hunter

The most recognized constellation along with the Big Dipper, The most striking feature is Orion's belt of 2nd magnitude stars. Besides his belt, note his shoulders and feet of bright stars, sword, shield, club, and head. He makes quite a figure.

Betelgeuse in Orion's shoulder is *sometimes* the 8th brightest star shining between magnitudes .2 to 1.2. It is a red supergiant, 640 light years away. Betelgeuse is one of the largest stars known would encompass everything out to the orbit of Jupiter if it were our sun..

Rigel, the 6th brightest star at magnitude .12, is a blue white supergiant 860 light years away. Actually a triple star system, with B component telescopically a challenge, and C component spectroscopic.

M42, The Great Orion Nebula, is easy to find with binoculars in Orion's sword. At 1344 Light Years it is the closest region of star formation to earth. A small telescope will yield the trapezium consisting of some of these new stars. This is known as an Emission nebula.

M43 is the northern part of M42. Beautiful region for binoculars. Theta the last star in the belt is a binocular double star.

M78 is a Reflection Nebula of magnitude 8.0 just north of the belt. It is visible as a small blob in binoculars. Both Emission and Reflection nebulas are also known as diffuse nebula which means that they don't have a well defined boundary. Emission nebula are red in photographs and reflection nebulae are blue. Diffuse nebula is a nebulae without discernible boundaries and includes both emission and reflection.

Orionid Meteor Shower-Peaking on the night of October 21/22, the Orionid's are produced from an old passage of Halley's Comet. Visual rates can reach 20 per hour for Northern Hemisphere observers and 40 per hour for Southern Hemisphere observers. Best observed a few hours before dawn. Meteors are swift .

Taurus the Bull

Orion seems to be raising his club to the charging bull. The large open cluster known as the Hyades with Aldebaran shining at an eye position leads you to the horns of the bull. Beta Taurus is shared with Auriga.

Aldebaran is a red giant shining at .87 and is 66 light years away.

Plieades (M45) (the seven sisters) is one of the best known objects in the heavens. Every culture had stories about it. It is an open cluster with nebulosity and is about 500 light years away.

Hyades is an open cluster around Aldebaran (unrelated). It is the nearest open cluster at about 150 light years away.

M1 or Crab Nebula is a diffuse nebula that was created from a supernova observed and recorded in 1054 AD by Arab, Chinese, and Japanese astronomers. Need dark skies to see with binoculars.

Gemini the Twins

Castor and Pollux were the twins that navigated the ship Argo on Jason's quest for the golden fleece. Bright stars make a rectangle with an important tail to the east.

Pollux, the 14th brightest star, shines at 1.14 mag. It is about 40 light years away and shines with an orange hue.

Castor is actually a binary through a small scope. It's two components of 2.0 and 2.9 combine to make it magnitude 1.58. The 23rd brightest star is about 50 light years awy.

M35, is a bright mag 5.1 open cluster easy to find off Castor's leg. Nice region in binoculars.

Gemenid Meteor Shower-Peaking about the night of 13/14 December this shower can produce rates of 60-80 per hour. Dress warm for this one that you can start observing between 11:00 and midnight. The Geminids compete with the Perseids for the best annual display. Medium to slow meteors often showing colors.

Auriga the Charioteer

Another geometric shape, Auriga is a pentagon. The three stars to the east are known as the kids.

Capella is the 6th brightest star shining at .08 magnitude. It is a yellow star (actually a multiple star system) similar to our sun 41 light years away.

M36, M37, and M38 are nice open clusters easily visible in binoculars in a line. Through binoculars try to see variations in shapes and density.

Epsilon Auriga, one of the kids, is a supergiant with a companion. It is an eclipsing binary that fades up to 1 magnitude for almost two years every 27 years. Next eclipse is around 2037.

Winter Hexagon Continued

Canis Major the Great Dog

When Sirius first rises in the morning in August it signified the rainy season in Egypt and the dog days of summer for the ancient Greeks. A very bright constellation east of Orion.

Sirius, the brightest star, shines at magnitude –1.5. One of our closest neighbors at 8.6 light years away. Sirius is a blue white star about twice the size of our sun, but much more luminous. It is actually a binary star.

Adhara, shines at magnitude 1.5 making it very close to 1st magnitude. It is a blue white binary about 500 light years away.

M41 is an open cluster with some reddish stars near the heart of Canis Major. Also known for delicate curves in the cluster.

Canis Minor the Little Dog

Canis Major's companion is a small constellation consisting of a pair of interesting stars.

Procyon, is the 8th brightest star shining at mag .38. It is a beautiful deep yellow star and one of our stellar neighbors at 11.5 light years away. It is actually a binary system with a faint white dwarf. Many stars are actually binary or multiple star systems. Our sun might be if Jupiter had been a little bigger.

Gomeisa or Beta Canis Major is a hot blue white star shining at magnitude 2.9. It is a nice region to look at with binoculars.

Monoceros the Unicorn

Formed in about 1624, Monoceros includes some beautiful objects as the Milky Way passes through it. Try tracing it out in dark skies.

M50 is a bright open cluster on the border of Monoceros. Easy binocular object at magnitude 5.9.

Rosette Nebula is a star forming Emission Nebula. It is closely associated with Open Cluster **NGC 2244** which contains stars formed from the nebula. The region is easy in binoculars using Betelgeuse and Mu Orion as guides. Beautiful binocular region.

NGC 2264 the **Christmas Tree Cluster** also contains the Cone Nebula. The Cone Nebula is a dark absorption Nebula in an emission nebula. The cluster is an easy object, but the Cone Nebula is for larger scopes or photographs. a bright open cluster and the Cone Nebula.

NGC 2232 is a very bright open cluster at magnitude 3.9.

Puppis the Stern

In the Milky Way and Part of the ship Argo, Puppis has many open clusters for binoculars.

M46 is a beautiful open cluster in a small telescope. Through a larger scope it has a faint planetary nebula imbedded in it.

M47 is a bright naked eye open cluster. Very nice in Binoculars.

M93 is another nice Binocular Open Cluster.

Eridanus the River

An ancient constellation that tarts near Orion and goes almost all the way to the South Celestial Pole. Little of interest.

Lepus the Hare

Easy to find under Orion. Convenient for the hunt. Nice configuration.

Hind's Crimson Star (R Lep)—A deep red variable star varying from 5.5 to 11.7 Magnitude. Period 445 days. Color most striking near minimum. AAVSO (VSP) Chart 10241HZ.

M79 is a magnitude 8.5 Globular Cluster. It seems out of place with most Globulars being in the summer sky. Faint binocular object

Observing Variable Stars

Throughout this guide, naked eye Variable Stars are listed. In most cases you will find stars near them with a pair of numbers beside them in italics. These are fixed magnitude stars you can compare the variable to. For example Algol on the Fall Square page has comparison stars of *18* (1.8), *21* (2.1), *30*(3.0). Note that the dot is not included to prevent confusion that it might be a star..

So if the star's brightness is half way between 2.1 and 3.0 then you would guess 2.5 or 2.6.

Charts for many variable stars can be printed out at www.aavso.org/vsp. For more information on Variable Stars and to enter your observations into a database used by Astronomers around the world, visit www.aavso.org.

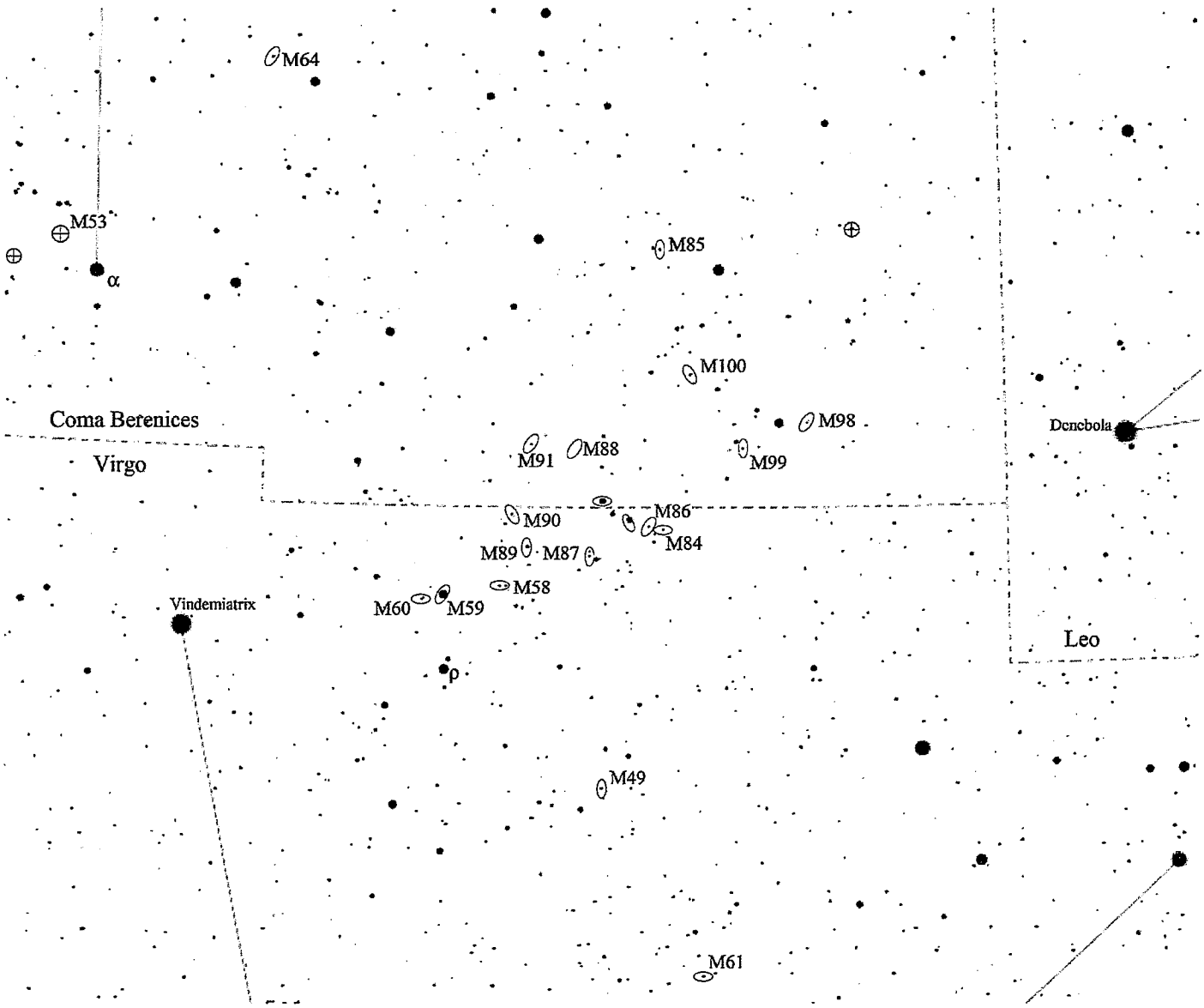
Star Hopping the Messiers in the Virgo Cluster

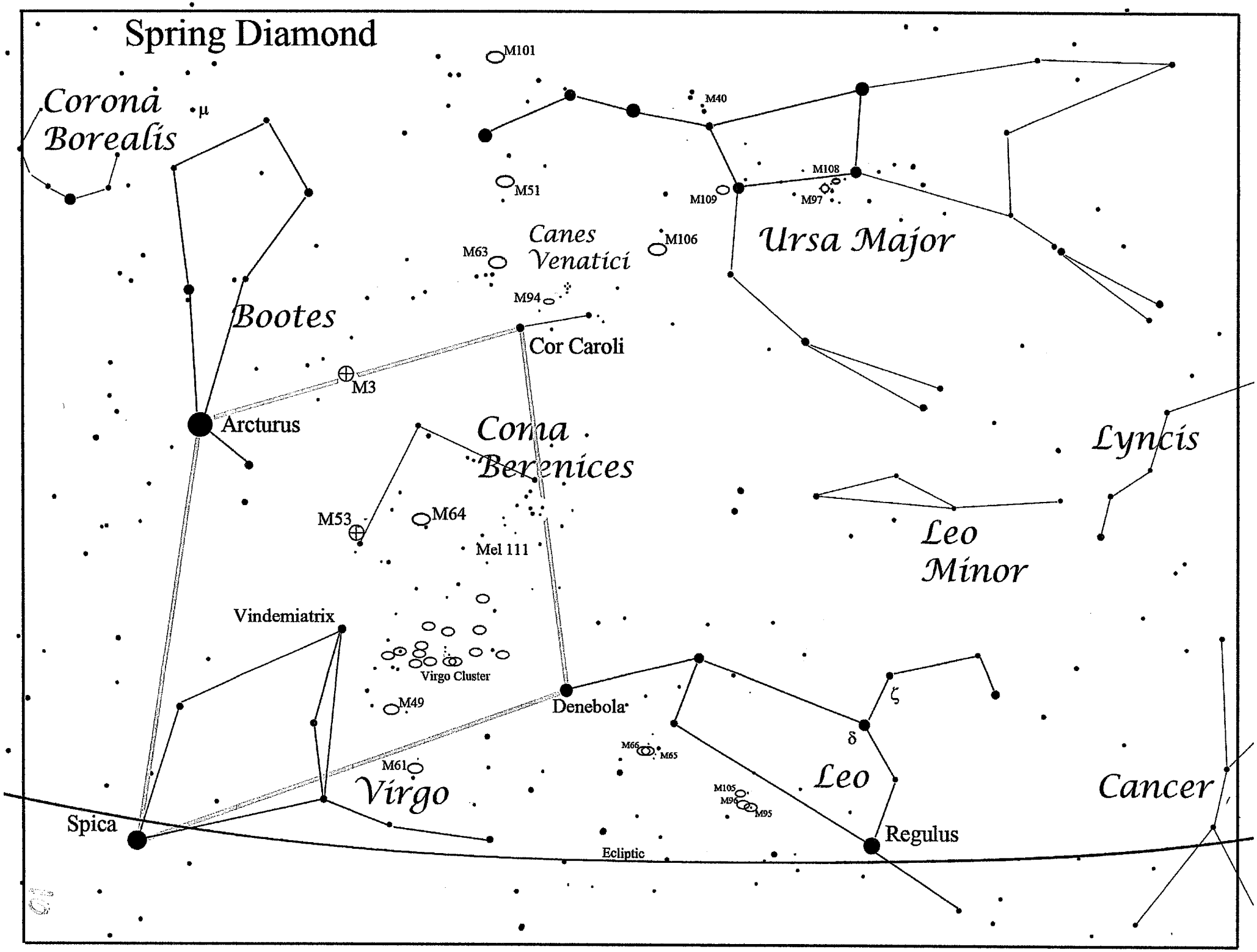
The Virgo cluster lies between Denebola and Vindemiatrix. Before tackling with a scope (8" Minimum with dark skies), use binoculars to familiarize yourself with the field.

Find the little arrow with Rho Virgo at its center just west of Vindemiatrix. Starting there follow the arrow, bearing to the right to find the two bright stars on the west side of the Messiers (near **M98** and **M85**). You will be working this area.

Starting with the arrow find **M59** and **M60**, move to **M58** then up to **M89** and **M90**. Now using these galaxies move to **M87**, then **M84** and **M86** in the same field. Move back to the east through some other galaxies (Markarian's Chain) to pick up **M88** and **M91**. Now move on to the two stars on right side of field and pick up **M99**, **M98**, **M100**, and **M85**. Star hop to **M49**, **M61**, and **M64** to complete galaxies in Coma Berenices and Virgo. Don't forget to look at the Globular **M53** while your in the area.

Markarian's Chain includes M86 and M84 middle right and M87 lower left. A pair of galaxies known as "The Eyes" is to the left (east) of M86. Photo by Wade Van Arsdale, Central Arkansas Astronomical Society. Taken with .....




Spring Diamond
Corona Borealis
μ
M101
M40
M51
M108
M109
M97
Canes Venatici
M106
Ursa Major
M63
M94
Bootes
Cor Caroli
M3
Arcturus
Coma Berenices
Lyncis
M53
M64
Mel 111
Leo Minor
Vindemiatrix
Virgo Cluster
M49
Denebola
ζ
δ
M66
M65
M61
Virgo
Leo
M105
M96
M95
Cancer
Spica
Regulus
Ecliptic

Spring Diamond

March to July in the evenings

Start finding the Spirng Diamond by using the handle of the **Big Dipper** to make an "Arc" to Arcturus and then "Speed" on to Spica (pr. Spaeke). Now use the curve of the Big Dipper handle and find the center of the circle it makes. Theres your third star Cor Caroli. Add the tail of the lion Denebola and you have the Spring Diamond containing three constellations with 1st magnitude stars.

Bootes the Herdman

You've already found Arcturus, now trace out the kite with a tail with Arcturus at the bottom of the kite. Bootes is a kite with a tail.

Arcturus, the harbinger of spring, is the 4th brightest star at magnitude –.04 and the brightest star north of the Celestial Equator. It is an orange star only 36.7 light years from earth.

Mu Boo is a binocular double mags 4.3 and 7.1, 109" Sep

Virgo the Virgin

From Spica, trace out the wedding cup. Another old asterism is Virgo's Diamond as shown on the chart. So Virgo has her own diamond to go along with the larger spring diamond. Virgo has more galaxies than any other constellation. Most are beyond the reach of binoculars. I've listed some binocular possiblities here and a supplemental chart for the telescope looking to see all the Messier Objects.

Spica is the 14th brightest star at mag 1.04. It is a blue giant 260 light years from earth, a spectroscopic binary, and is also slightly variable of the Cepheid type. Being close to the ecliptic it is sometimes occulted by the moon.

M104 the **Sombrero Galaxy** brightest of the Virgo Galaxies. May require higher power binoculars.

M49 Eliptical Galaxy is a challenge for smaller binoculars.

Virgo Cluster is a group of 1500 to 2000 galaxies located in Coma Berenices and Virgo. The brighter galaxies are Messier objects. Note location between Vindemiatrix and Denebola.. See supplemental map and notes for viewing the Virgo Cluster with telescope or large binoculars.

Canes Venatici the Hunting Dogs

A line from Cor Caroli to 4.2 mag Beta Canes Venatici is all it takes to complete this constellation. It has deep sky objects for Binoculars and Cor Caroli is a star of interest.

Cor Caroli is the only star named for a real person. It means heart of Charles and was named in honor of Charles I following his execution in 1649. Cor Caroli is a beautiful binary double through a small scope—blue on blue. The system is 110 light years away the shines at mag 2.81.

M3 Seemingly misplaced this bright gobular has a moderate concentration toward the center.

M51 the Whirlpool Galaxy is a spiral galaxy visible in binoculars.

M63 the Sunflower Galaxy,a spiral galaxy, is a challenge for binoculars.

M106 an eliptical galaxy and **M94** a spiral galaxy need larger binoculars or a telescope to see.

Leo the Lion

Completes the constellations making up the Spring Diamond. A sickle or a question mark makes up the front quarters and head and a triangle the tail. Before Coma Berenices became a constellation the cluster was the tuft of the tail.

Regulus is one of four 1st magnitude stars near the ecliptic,. It is the 20th brightest star shining at 1.35 magnitude. At 77.5 light years away it is actually a four star system. Also known as the "king" star and the heart of the lion.

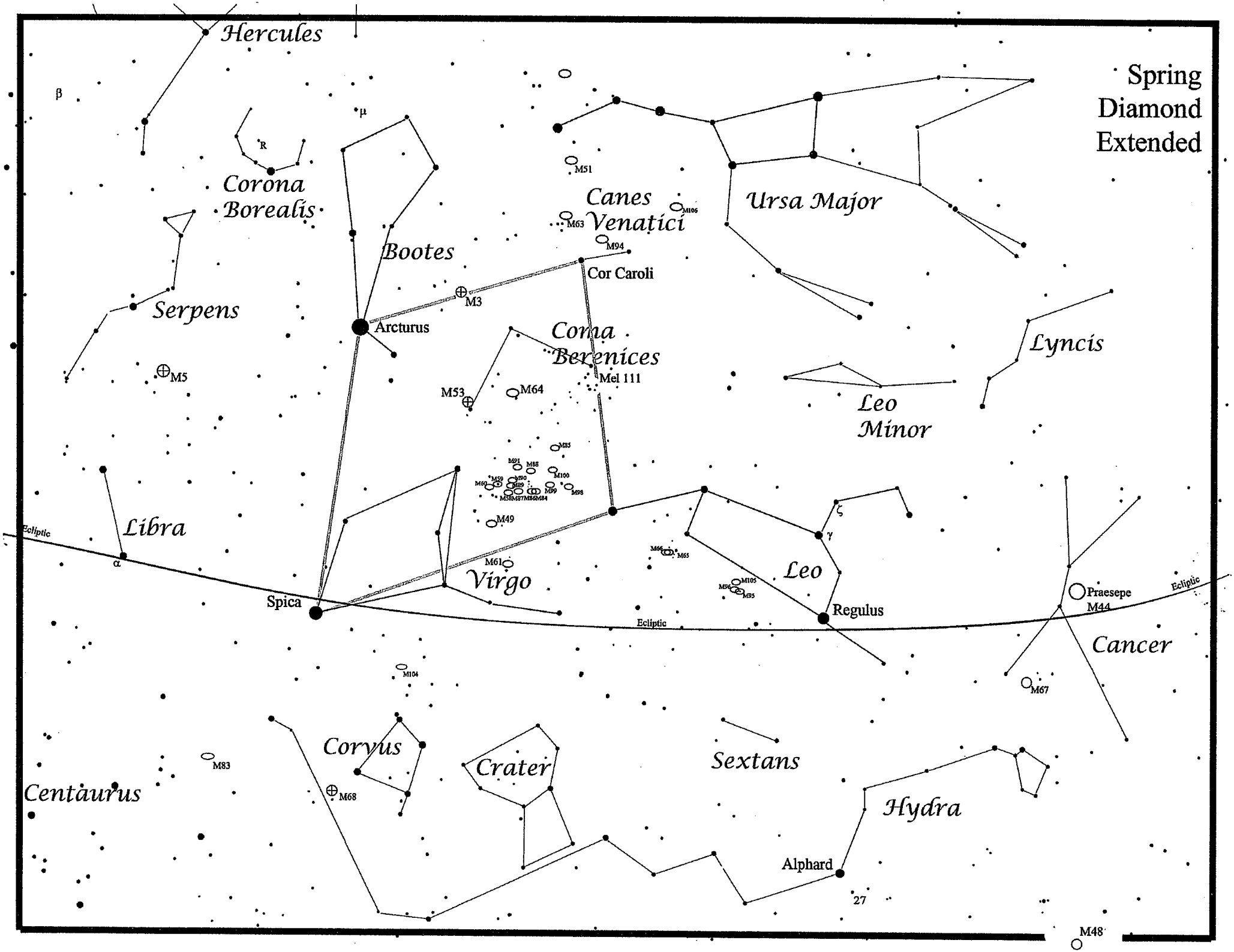
Messier objects M65, M66, M95, M96, & M105 are all faint galaxies best suited for the telescope.

Zeta Leo is a double 3.5 & 6.0, Sep 334"

Delta Leo is a little more difficult double at 2.6 & 8.6, Sep 204"

Leonid Meteor Shower has produced some of the brightest meteor displays seen and is the shower that first gave astronomers facts leading to the understanding of meteors. 10-15 meteors are normally seen the night of November 17-18. Very fast meteors, some very bright, leaving trails. For several years surrounding 2033 the rates will pick up substantially exceeding the Perseid's and Gemenid's.

Spring Diamond Extended—Now that you have the Spirng Diamond down pat, go to the Spring Diamond Extended to expand this exciting part of the sky.


Spring
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M51
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M106
M94
Bootes
Cor Caroli
M3
Serpens
Arcturus
Coma
Berenices
Mel 111
Lyncis
M5
M53
M64
Leo
Minor
M85
M91
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M95
Spica
Regulus
Praesepe
M44
Ecliptic
Cancer
M104
M67
Corvus
Crater
Sextans
M83
Centaurus
M68
Hydra
Alphard
27
M48

Spring Diamond Extended

Coma Berenices or Berenice's Hair

The only constellation named after a real person. Named after Egyptian Queen Berenice who dedicated her hair to Aphrodite for her husbands safe return. When her hair disappeared from an altar the court Astronomer pointed out that her gesture had been commemorated by her hair moving to the heavens. Coma Berenices is represented by 3 4th mgnitude stars but it's primary identifier is the Coma Berenice's Star Cluster off the tail of Leo.

Coma Berenices Star Cluster, Melotte 111, is a fine low power wide field binocular object. Consisting of 80 5th and 6th mag stars spanning almost 5 degrees. Visible without binoculars also.

M64 the **Black Eye Galaxy** is a spiral galaxy with dark absorbing dust over part of the galaxy and nucleus. About mag 8.5 it can be glimpsed in 7x binoculars.

M53 is an 8th magnitude globular cluster.

Hydra the Water Serpent

The longest constellation with Hydra's head below Cancer and its tail extending to Libra. The head is a nice little circlet of 3rd & 4th magnitude stars. Below that is bright Alphard.

Alphard shines at mag 1.95 and is 177 light years away. Alphard means solitary one as there are no other bright stars near it. It is a giant star about 50 times as large as the sun.

M48 is a very bright open cluster. Messier had location wrong, but this meets his description.

M68 is a dim Globular Cluster at magnitude 8. It is visible as a dim round nebula in binoculars.

M83 is a barred spiral galaxy. Bright for a galaxy in a nice field.

27 Hydra is a binary star near Alphard. Components are 4.9 and 7.0 with 229" Separation. Contrasting colors.

Crater the Cup.

Faint cup sitting on the back of Hydra and just out of reach of a drink of water for the crow.

Corvus the Crow sometimes called a sail.

Nice bright quadrilateral (four sided) asterism below Spica, The crow was sent with the cup (Crater) to get water for Apollo. It stopped to eat figs and then grabbed the water snake in it's mouth and told Apollo it kept him from getting water. For his lie, Corvus along with the cup and Snake were banished to the heavens.

Corona Borealis the Northern Crown

Just to the east of Bootes and west of Hercules this little semicircle looks like a crown and is a favorite figure. It has several interesting variables that are more suited for telescopes.

R CrB usually hangs out about 6th magnitude but will go down to 14th magnitude over a few weeks and then return as fast as it went down. It is an unusual Variable. As of early 2013 it has been in a 4 year minimum and appears to be coming out of it. It did this once before in 1963. Normally minimums are only a few months long.

Cancer the Crab

A very dim constellation in the Zodiac between Gemini and Leo.

M44 the Praesape or beehive cluster is visible to the naked eye at magnitude 4.5 and is a nice sight through binoculars.

M67 is a nice open cluster about magnitude 7.5 looking like a nebula in 7x35's.

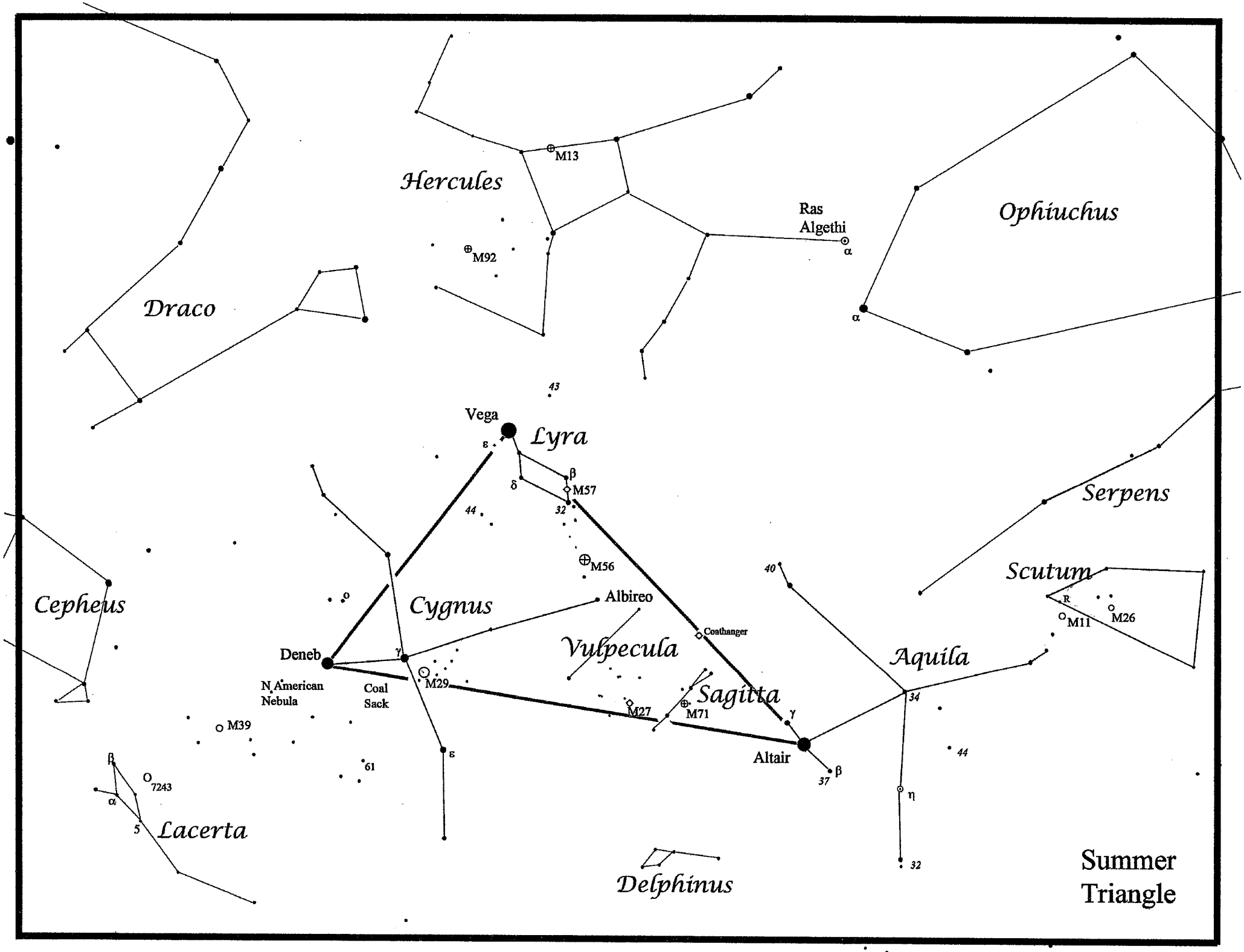
Libra the Scales

Pair of third magnitude stars between Virgo and Scorpio on the ecliptic. At one time these were the claws of the Scorpion.

Alpha Lib named Zuben El Genubi the southern claw is a wide binary star Mag 2.8 and 5.2 with Sep 231".

Sextans the Sextant
Lynx the Cat
Leo Minor the small Lion

These 3 constellations are dim and have little of interest.


Hercules
M13
M92
Ras
Algethi
α
Ophiuchus
α
Draco
43
Vega
Lyra
ε
β
δ
M57
32
44
Serpens
M56
40
Scutum
R
M11
M26
Cepheus
o
Cygnus
Albireo
Coathanger
Vulpecula
Aquila
Deneb
γ
N American
Nebula
Coal
Sack
M29
M27
M71
Sagitta
γ
34
M39
ε
Altair
β
37
44
61
β
O
7243
α
5
Lacerta
η
32
Delphinus
Summer
Triangle

Summer Triangle

Visible May to December

Find the summer triangle whenever you go out from Spring till winter. In Spring it will just clear the horizon in the east by 9:00 pm and is visible low in the west until the New Year rings in. Commit to memory Vega, Deneb, and Altair along with Lyra, Cygnus, and Aquilae.

Lyra the Lyre

A prominent constellation with the 5th brightest star. Constellation looks like the Lyre or Harp it is named for.

Vega at mag .03, was the 1st star photographed in 1850, the first to have it's spectrum taken in 1872, and was the pole star 12000 years ago and will be again in 13,000 years. Vega is a blue white main sequence star about 25 light years away.

When Vega first peaks over the eastern horizon there are more first magnitude stars in the sky than any other time. Rigel, Sirius, Aldebaran, Betelgeuse, Procyon, Capella, Pollux, Arcturus, Spica, Regulus, Vega. Also barely 2nd magnitude stars Castor, Adhara, Bellatrix, Elnath

Beta Lyrae is a close binary star that is variable. Normally it is close to magnitude 3.4 but every 14 days it dips to magnitude 4.6. Note comparison magnitudes on chart.

M57 the Ring Nebula. Smoke ring in the sky through scope. Mag 9.

Epsilon Lyra the double double through telescope. Nice double through binoculars. 5.2 & 5.3 Sep 208"

Delta Lyra is wide double. 4.3 & 5.6, Sep 617" . Note colors

M56 globular cluster. Faint Globular at mag 9.

Lyrid Meteor Shower—night of April 21/22. Weak but consistent shower with max at about 10 meteors/hr. Often produces some fireballs. Medium speed.

Cygnus the Swan

Or the Northern Cross if leave off the wingtips. With the wingtips Cygnus actually looks like a Swan flying south down the Milky Way.

Deneb is a luminous blue white supergiant lying about 2600 light years away. One of the brightest stars known. 19th brightest star with apparent magnitude of 1.25. Deneb means tail in Arabic representing the tail of the swan.

Albireo, the hen's beak, is a famous wide double. Visible through stabilized binoculars, it is magnificent through any scope. Orange 3rd Mag primary and Blue 5th Mag secondary, Sep 34".

61 Cyg a close neighbor at 11 light years, was first star whose distance was measured with paralax. Requires small scope. Mags 5.4 & 5.6 with sep 31"

Omicron Cyg is a nice double through binoculars. Mags 3.9 and 4.8 sep. 334"

M39 nice open cluster and region through binoculars.

M29 poor open cluster near Gamma.

Coal Sack is a cloud of opaque dust that blots out the Milky Way. With dark skies look for the region between Debeb, Gamma, and Epsilon. Now with binoculars move to the northern edge and NW of Deneb. In a dark sky try and make out the **North America Nebula**.

Aquila the Eagle

Another bird flying down the Milky Way.

Altair flanked by companions Beta and Gamma forms a straight line pointing to Vega. This third star in the summer triangle shines at Mag .8 and is 16 light years distant. The twelfth brightest star it was chosen as the standard 1st Mag star when the magnitude scale was established in 1854 by Pogson.

Eta Aquilae was discovered to be Variable by Edward Pigot in 1784. It is a Cepheid varying from magnitude 3.7 to 4.5 over 7.2 days.

NGC 6709 open clusters are nice binocular objects.

Scutum—Sobieskies' Shield

M11 the Wild Duck Cluster is an open cluster easy in binoculars and impressive through a small scope. Mag 7.0

M26 8th Mag Open cluster.

Scutum Star Cloud—Bright spot in milky way next to M11.

R Scutum– Near M11 R Sct makes a nice trapezoid with 3 other stars in binoculars. Print out a chart at www.aavso.org to estimate it's brightness.

Sagitta the Arrow imbedded in the Milky Way.

M71 Globular Cluster mag 8.5 is easily located near the arrows shaft.

Delphinus the Dolphin or Job's Coffin makes a very nice trapezoid.

Vulpecula the Little Fox

M27 the Dumbbell nebula, A misty spot in binoculars. Mag. 7.5.

Alpha and 8 Double mags 4.6 & 5.9 sep 427"

Coathanger– An interesting binocular group of 6th & 7th Mag Stars

Hercules the Hero or Giant

A fun summer constellation identified primarily by the Keystone made up of 3rd and 4th magnitude stars.

M13 the Great Hercules Globular Cluster can just be seen with the naked eye and is an easy binocular object with its position in the Keystone. Magnitude 6.

M92 is another very nice Globular at magnitude 7.5. It is much denser at the center than M13.

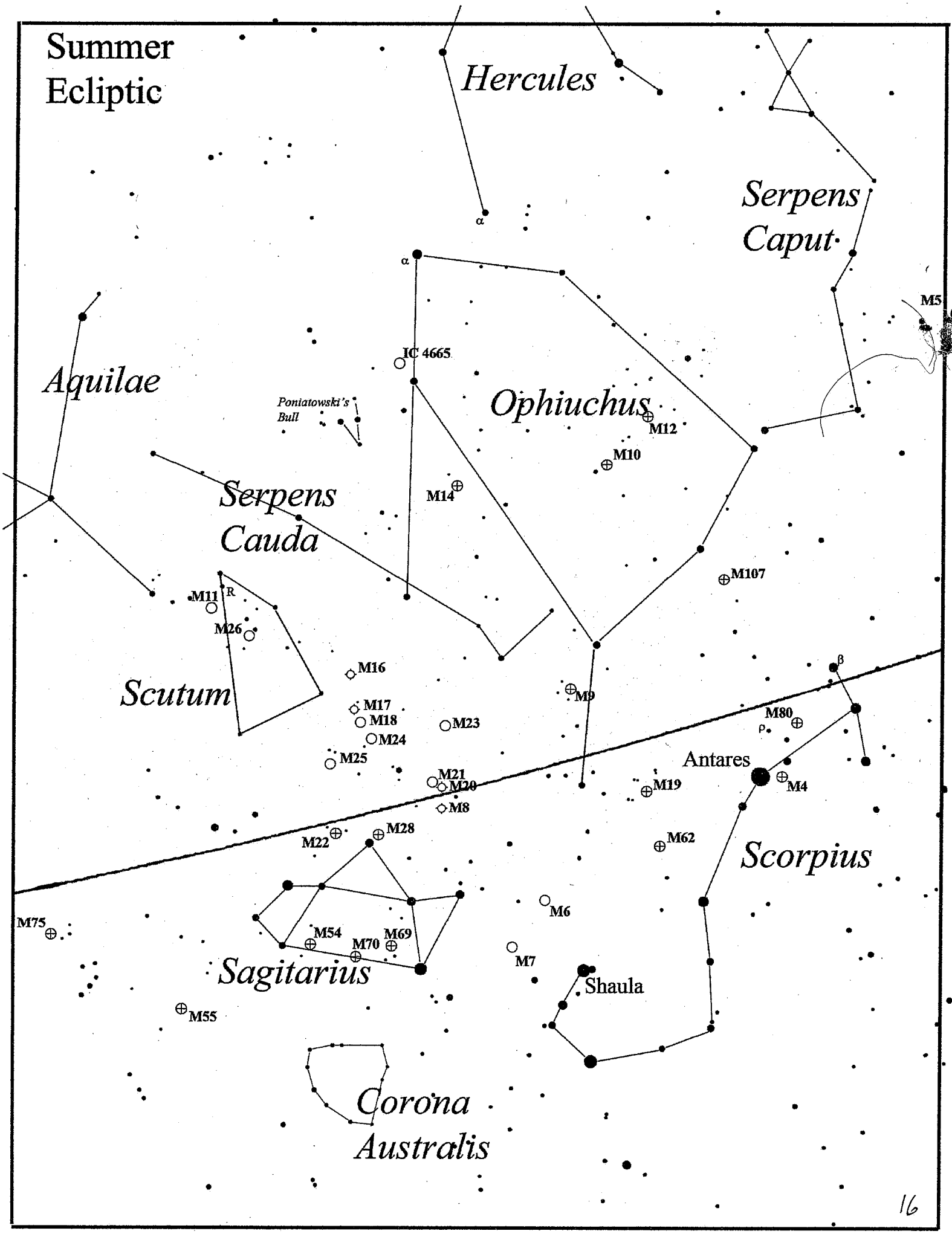
Alpha Hercules or Ras Algethi is a naked eye variable varying from 2.73 to 3.46 with a period of 125 days. It is a red supergiant. Through a telescope it is a close double with contrasting colors.

Lacerta the Lizard

Difficult constellation of 4th and 5th magnitude stars. Find it using the little triangle on corner of Cepheus.

NGC 7243 is a nice open cluster located to the North of α & β Lacertae

5 Lac is a pretty orange star at magnitude 4.3


Summer
Ecliptic
Hercules
α
Serpens
Caput
α
M5
IC 4665
Aquilae
Poniatowski's
Bull
Ophiuchus
M12
M10
Serpens
Cauda
M14
M107
M11
R
M26
M16
Scutum
M17
M18
M23
M24
M25
M9
β
M80
ρ
Antares
M4
M21
M20
M8
M19
M22
M28
M62
Scorpius
M6
M75
M54
M69
M70
M7
Sagitarius
Shaula
M55
Corona
Australis

Summer Ecliptic

Visible July to Oct in the evenings

This area of the sky contains more bright Messier objects that any other. See how many you can see with Binoculars. Start by locating bright Antares in the south. For most northern hemisphere observers the summer ecliptic is low in the south.

Ophiuchus the Serpant Bearer

Large constellation easy to trace out with a lot of bright stars. It contains about 21 degrees of ecliptic while Scorpius as the Zodiac representative only has about 6 degrees.

M10 and M12 are 7-8 mag Globulars in the same binocular field. Through a telescope note their different concentricities.

IC 4665 Beautiful open cluster in Binoculars or Telescope. About 1400 light years away

M107 8th magnitude Globular.

M62 8th mag Globular. Highly concentrated in scope.

M9, M14, M19 8.5—9th mag Globular Clusters difficult with small binoculars.

Rho Oph Triple star near the Antares. Mags 5.1,7.3, 6.8. 150" and 156" seperation

Poniatowski's Bull Constellation formed in the middle ages but now part of Ophiuchius. **Taurus Poniatovii** (Latin) named for it's similarity to the Hyades in Taurus. **Barnard's Star** the closest star visible in the northern hemisphere is just west of the western star at top of the V. Asterism naked eye or binoculars.

Serpens Caput and Serpens Cauda

Separated by Ophiuchus are the serpents head (Caput) and serpents tail (Cauda).

M5 in Serpens Caput. Concentrated center. Easy in binoculars North of B Libra. Rival to M13 with same scope and magnification. Also shown on Spring Diamond Extended Chart.

M16 the Eagle Nebula in Serpens Cauda Just north of M17 and M18 in Sagitarius. Star forming region containing an open cluster formed from the Nebula. Easy in Binoculars. Very interesting in a telescope especially with a nebula filter.

Corona Australis the Southern Crown

Distinctive circlet of 4th and 5th magnitude stars just south of Sagittarius. The ancient Greeks saw it as a wreath.

Scorpius the Scorpion

Outstanding constellation with Antares at the heart of the Scorpion. At the end of the long winding body note the stinger with Shaula, one of the brighter stars, falling just under 1st magnitude.

Antares, a red supergiant, is the 15th brightest star and 470 light years away. It's name means Anti Mars named that because it has a similar red hue. Antares along with Aldebaran, Regulus, and Spica is close to the ecliptic being passed or occulted by the moon or planets.

M4 Bright loose globular cluster near Antares.

M7 the brightest open cluster in Scorpius. Easily naked eye between Shaula and teapot of Sagitarius.

M6 the Butterfly Cluster. A very bright open cluster north of M7.

M80 bright globular cluster halfway between Antares and Beta Scorpius.

Omega Sco Double Star 4.0 & 4.3. 877" Sep

Zeta Sco Double Star 3.6 & 4.7 391" Sep

Mu Sco Double Star 3.1 & 3.6 347" Sep

Sagittarius the Centaur also Archer

The teapot asterism is the best way to see Sagittarius. The teapot seems to be pouring milk down the Milky Way. Looking at Sagittarius you are looking toward the center of the galaxy. Many bright deep sky objects.

M8 the Lagoon Nebula. Very bright diffuse nebula with an open cluster in the foreground. Look for the lagoon in a scope.

M20 the Trifid Nebula. Just north of M8 maybe in the same binocular field of view (FOV). Again an Open Cluster in the foreground. In a scope the nebula divides into three parts.

M21 is a very bright open cluster just north east of the trifid in the same binocular FOV.

M22 very bright globular Brighter and larger that M13.

M28 a fine globular through a telescope.

M25 a very bright open cluster that contains the Binocular Variable U Sgr.

M24 Small Sagittarius Star Cloud. Naked eye object.

M23 Large rich naked eye open cluster.

M18 Open cluster. Looks like a haze in 7x35 binoculars, but resolvable in scope.

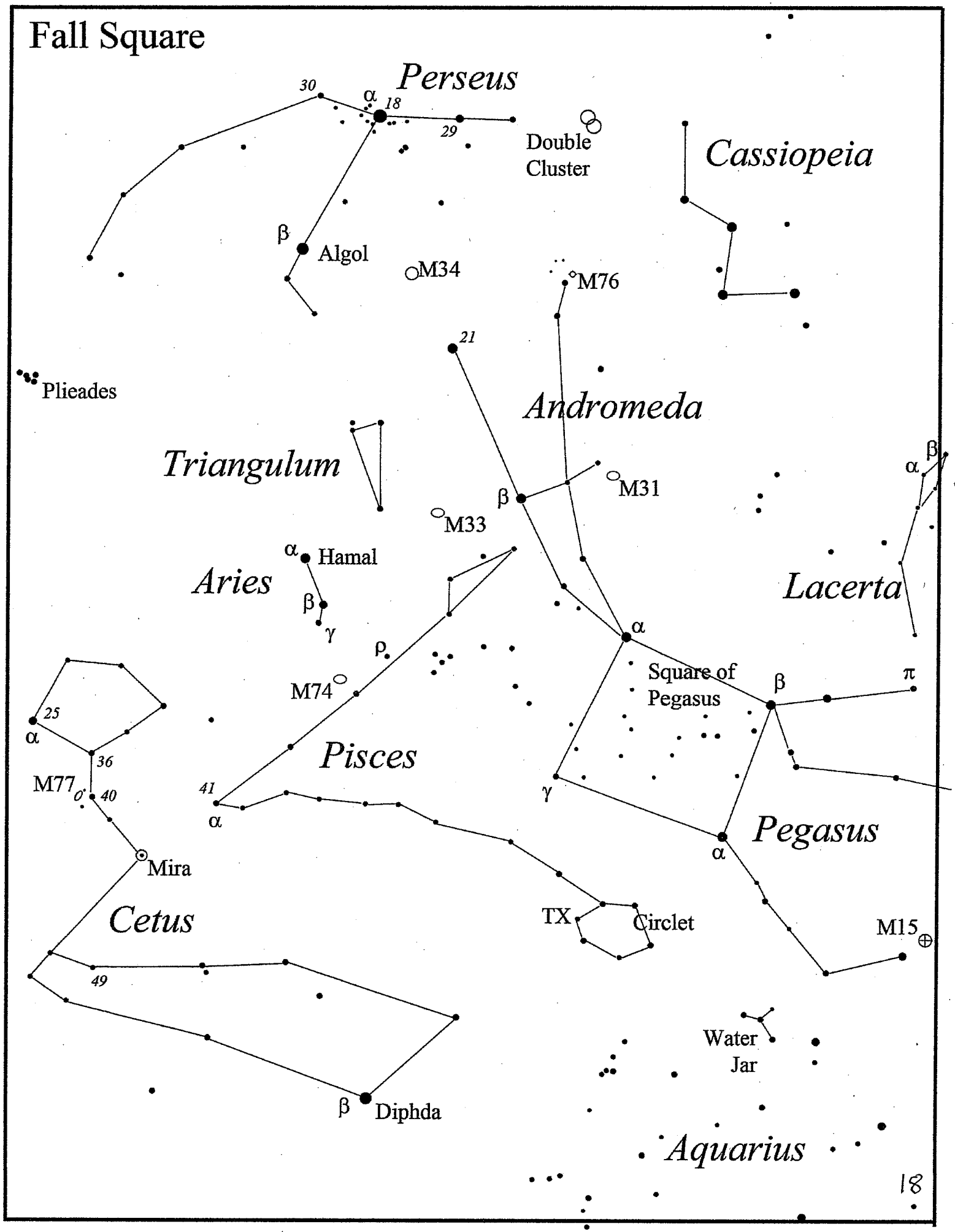
M17 the Omega Nebula. Named by William Herschel, bright nebula that resembles a swans neck.

M54 8th mag Globular.

M55 Nice 7.5 mag Globular

M69, M70, M75 are 9th mag Globulars and low in sky will be difficult for small binoculars.

Fall Square


Perseus
30
α
18
29
Double
Cluster
Cassiopeia
β
Algol
M34
M76
21
Plieades
Andromeda
Triangulum
β
M31
α
β
M33
α
Hamal
Aries
β
γ
Lacerta
α
ρ
Square of
Pegasus
β
π
M74
25
α
36
Pisces
M77
40
41
γ
α
Pegasus
α
Mira
Cetus
TX
Circlet
M15
49
Water
Jar
β
Diphda
Aquarius
18

Fall Square—Square of Pegasus

An important asterism for orienting both in the sky and on land. Leads you to the realm of the Titans—Clash of the Titans with Perseus, Pegasus, Andromeda, and of course the monster (Cetus). Use the Eastern leg of the triangle to locate Diphda in the whale and the Western leg to locate Fomalhaut. The NE star of the square is Alpha Andromeda while the other three stars are part of Pegasus. .

Pegasus the Winged Horse

If you have dark skies see how many stars you can count in the square. In ancient times claims of 32 were made

M15 a globular cluster visible in binoculars.

Pi 1 & 2 is an easy double in binoculars. Mags 4.3&5.6, Sep 573"

Pisces - Fish on a Stringer

Ecliptic Constellation

Find the circlet under the southern edge of Pisces. Use Aries to find the eastern string or "three guides" and start connecting the dots. Also use the three guides to locate Mira in Cetus.

Rho Psc is a binocular double 5.4 & 5.5 Sep 447"

Tx Psc near the circlet is a very red variable star.

M74 face on spiral galaxy requiring telescope.

Perseus the Hero

Savior of Andromeda, slayer of Medusa and the sea monster,

Perseids one of the best Meteor Showers, Aug 11 and 12 each year. Swift meteor often with trails.

M34 a bright open cluster visible in binoculars.

M76 is a faint planetary nebula. Star like in large binoculars. Try a nebula filter in scope.

Algol the Demon Star as called by the ancients An eclipsing binary that dims from mag 2.1 to 3.4 every 3 days. Eclipse lasts about 10 hours.

Double Cluster two open clusters naked eye, binocular, and telescope.

Cetus the Whale

Also the Sea Monster killed by Perseus, Largest constellation in area. Fun Constellation to trace.

Mira or Omicron Ceti. Most famous long period variable Ranges from 3.4 to 9.3 over about 11 months.

M77 10-11th magnitude Barred Spiral Galaxy. Near δ Ceti.

Diphda Brightest star at 2.02 in this region of the sky. Also known as Deneb Kaitos.

Triangulum the Triangle

Between Andromeda and Aries

M33 the Pinwheel galaxy at mag 5.5 is visible naked eye in dark skies and easy in binoculars. Note it's proximity to M31 and also how to find it using the stars of Andromeda.

Aries the Ram

Ecliptic Constellation. Distinct small triangle.

Gamma Aries One of the 1st doubles discovered it is a beautiful double through a small scope.

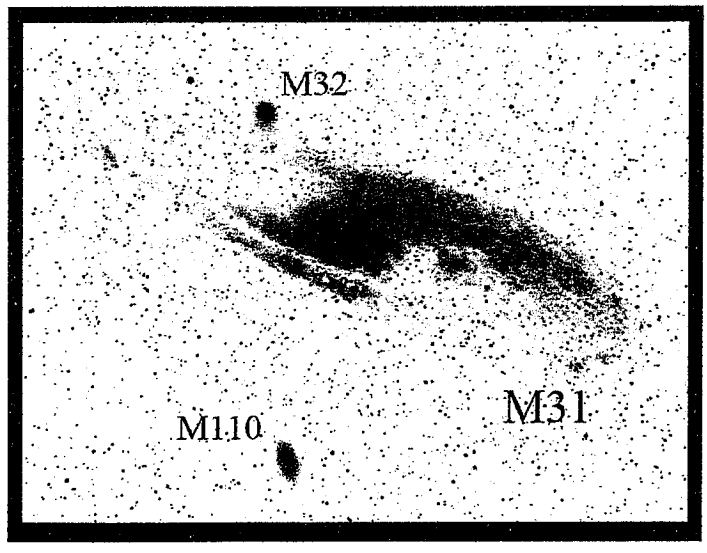
Hamal—Arabic for head of the ram. A red giant star at magnitude 2.0 it is 66 light years away

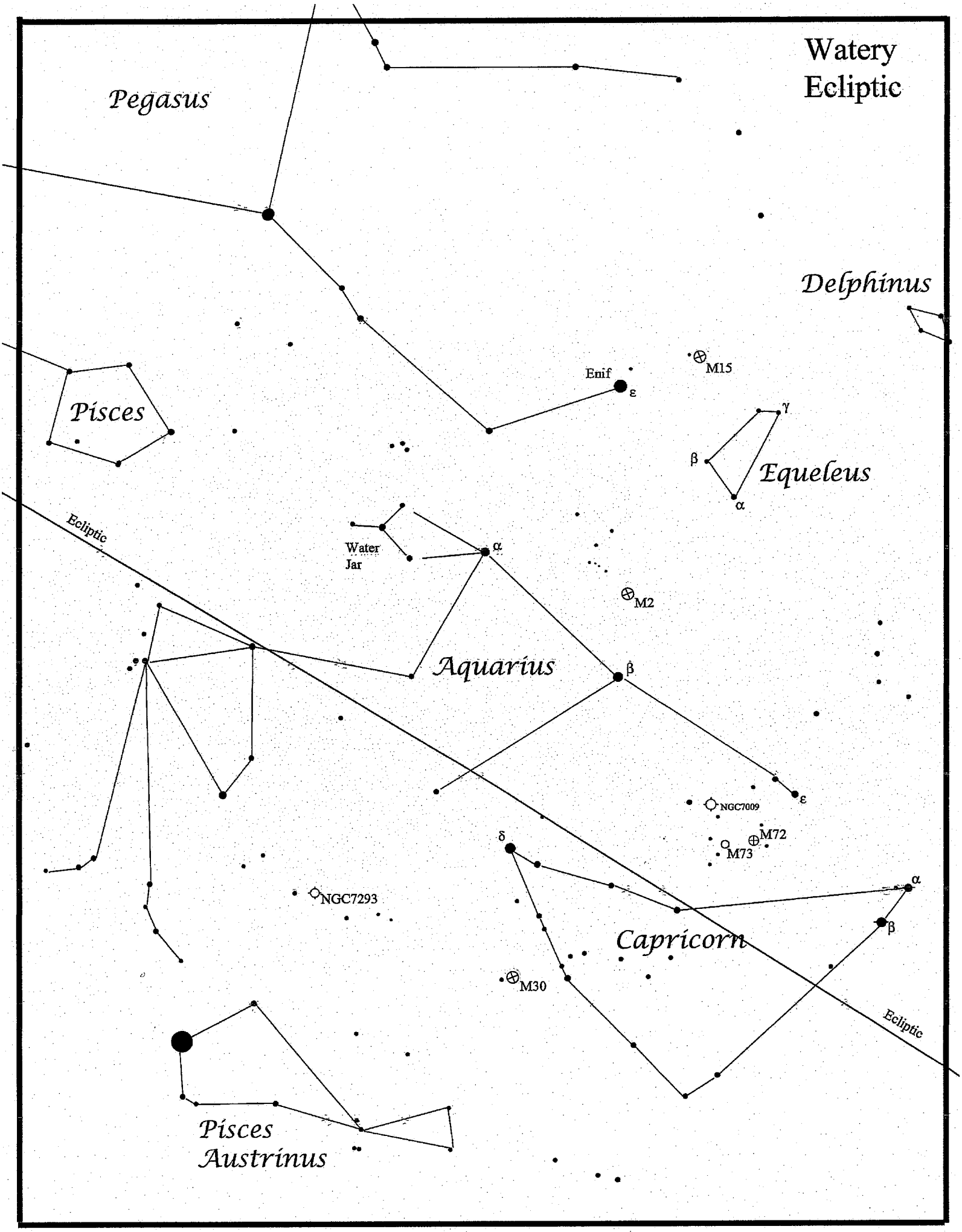
Andromeda the Chained Princess

The daughter of Cassiopeia and Cepheus was tied to a rock to be sacrificed to the seamonster Cetus.

M31 the Andromeda Galaxy is our sister galaxy and what we look like from about 1 million light years away. Visible naked eye at a dark sky and easy in binoculars. **M32** is difficult in small binoculars just South of M31. **M110** requires large binoculars or a scope.

α And Alpheratz is one corner of the fall square. It was also designated δ Peg by Bayer.




Watery
Ecliptic
Pegasus
Delphinus
Enif
ε
M15
Pisces
γ
β
Equeleus
α
Ecliptic
Water
Jar
α
M2
Aquarius
β
ε
NGC7009
M72
M73
δ
α
NGC7293
β
Capricorn
M30
Ecliptic
Pisces
Austrinus

Watery Ecliptic

Visible Oct to Dec in the evenings

This chart has the Sea Goat, Aquarius, and Pisces Austrinus. Add Pisces and Cetus and you've got the watery part of the sky. Start with the triangle made by Alpha and Beta Cap and Epsilon Aquarius. Also note the fall square and use it in your orientations.

Capricorn the Sea Goat

Easily traced out triangle in a moderately dark sky. On the ecliptic. Don't try and find the Sea Goat, but the triangle is very nice.

Alpha Capricorn is a naked eye double if you have good eyes. Magnitude 3.7 and 4.3 with separation of 381". Through binoculars both stars have a yellow tint.

Beta Cap binocular double. Mags 3.2 and 6.1. Separation 206". Blue and White.

M30 is a magnitude 7.5 globular cluster just off the eastern side of Capricorns triangle. Dense central core.

Aquarius the Water Bearer

Start with the star that makes a triangle with Alpha & Beta Cap and work your way up the water bearers leg. His head is a 4 star asterism known as the Water Jar. Note the streams of water dripping on the floor. A challenge but fun to trace out.

M2 is a bright globular cluster. Easy in binoculars. Use eastern side of Equuleus and guide stars on chart.

Water Jar 4 star asterism. Three 4th mag and one 5th mag stars.

M72 is a dim, distant globular at 9th magnitude. Fuzzy star in binoculars.

M73 is designated as an open cluster but it is really a small four star asterism visible in binoculars but a telescope is needed to separate into 4 stars.

NGC 7009 the Saturn Nebula is a green planetary nebula magnitude 8.4. Appears a green star in binoculars. Known as Saturn Nebula because of ring like extentions.

NGC 7293 the Helix Nebula is huge but has low surface brightness. A round hazy patch magnitude 6.5 that is one of the closest

Eta Aquarid Meteor Shower—night of May 5-6. A strong shower producing rates of 10-30 per hour just before dawn. Swift meteors that produce a high percentage of persistent trains, but few fireballs.

Delta Aquarid Meteor Shower—A reliable shower in late July peaking 27/28. Medium speed meteors with 10-20 per hour. Add the **Alpha Capricornids** peaking July 28/29 at 5-10 per hour and you have a good alternative to the Perseids if the happen to be hampered by the moon. The Alpha Capricornids are slow meteors.

Pisces Austrinus the Southern Fish

Western side of the fall Square points to Fomalhaut. **Fomalhaut** shines at magnitude 1.2 and is the 18th brightest star. It is a white star that is 23 light years away.

Equuleus the Little Horse or Horse's Head

In dark sky or through wide angle binoculars a nice trapezoid just west of Enif(mag 2.35 in Pegasus.

M15 on border with Pegasus is a 7 mag Globular Cluster. One of showpiece objects of the autumn sky it has a very dense center in a telescope. It is also the only Globular known that contains a planetary nebula.

Gamma & 6 binocular double mags 4.7, 6.1; Sep 335"

Observing Meteor Showers

Almost any clear night you can see meteors or shooting stars. Meteors are small bits of matter entering our atmosphere at a fast velocity creating friction with the atmosphere causing them to ignite.

Meteors are of several varieties. The Leonids and the Perseids are very fast often leaving trails. Other meteors like the Gemenids and the Quadrantids are medium speed. Slower speed meteors include the Alpha Capricornids and the Taurids. Some meteors show a color, while some leave trails and even smoke trails you can watch blowing in the wind.

Meteors originate from a source like a comet or in some cases like the Geminids, an asteroid. When traced backwards meteors belonging to a shower can be traced back to an area in a constellation, thus the naming of meteor showers.

Tips for observing meteors:

Dress for the season—summer include bug spray and a jacket. Winter, fall, and spring overdress because you will be still and you need to be comfortable to enjoy it and see the most meteors.

Lay down on pallet, mat, or in a lawn chair. You won't last long standing up and trying to look up.

Plan on observing after midnight for most showers. (Geminid starts about 10pm). After midnight we are on the front side of the fastball we know as earth.

Tools—red light, pencil and logbook for recording meteors. Atlas to establish your constellations if needed.

For your first shower pick one of the strong annual showers. It isn't any fun to see one, two, or none.

References, recording forms, observing programs, and much more information can be found on these websites.

Www.meteorshowersonline.com

Www.amsmeteors.org

Messier List

Charles Messier (1730-1817) was a French astronomer who discovered about twenty comets. Rather than to confuse star clusters and nebulae with comets and waste time having to reobserve them he began to catalog and describe them. So instead of comets Messier has become an everyday name among Astronomers because of the deep sky jewels he recorded. Messier's list is today a list for amateur's to view the best objects in the heavens. Observing all of them is a goal many have.

With Binoculars there is a program through the Astroleague that requires viewing 50. This guide includes the locations of all the Messier's. A good program would be to learn the heaven's and how to find your way around by finding at least 50 with binoculars. Be sure you start a log recording such things as date, time, location, instrument, description, and seeing conditions. Then start thinking about a telescope. There are many go to telescopes available today, but half the fun is being able to find it on your own. An 8 or 10 inch Dobsonian will give you views of all the Messier objects Messier could only dream of. The lists below have E for Easy, M for Medium, and D for Difficult. They are divided per the charts.

Fall Square

M#	Typ	Con	NGC	H Min	D Min	Mag	Size	Name	Difficulty
31	Gal	And	224	0 42.8	41 16	4.5	178'	Andromeda	E
32	Gal	And	221	0 42.8	40 52	10	8' X 6'		M
110	Gal	And	205	0 40.4	41 41	10	17' X 10'		M
77	Gal	Cet	1068	2 42.7	0 2	11	7' X 6'		D
34	OCl	Per	1039	2 42	42 47	6	35.0'		E
76	PlN	Per	650	1 42.4	51 34	12	3'x2'		D
74	Gal	Psc	628	1 36.6	15 48	11	10'		D
33	Gal	Tri	598	1 33.9	30 40	7	73' X 45'		E

Watery Ecliptic

M#	Typ	Con	NGC	H Min	D Min	Mag	Size	Name	Difficulty
2	GCl	Aqr	7089	21 33.5	0 49	7.5	12.9'		M
72	GCl	Aqr	6981	20 53.5	-12 32	10	5.9'		D
73	OCl	Aqr	6994	20 59	-12 38	9	2.8'		D
30	GCl	Cap	7099	21 40.4	-23 11	8.5	11.0'		M
15	GCl	Peg	7078	21 30	12 10	7.5	12.3'		E

Winter Hexagon

M#	Typ	Con	NGC	H Min	D Min	Mag	Size	Name	Difficulty
36	OCl	Aur	1960	5 36.1	34 8	6.5	12.0'		E
37	OCl	Aur	2099	5 52.4	32 33	6	24.0'		E
38	OCl	Aur	1912	5 28.7	35 50	7	21.0'		E
41	OCl	CMa	2287	6 47	-20 44	5	38.0'		E
35	OCl	Gem	2168	6 8.9	24 20	5.5	28.0'		E
79	GCl	Lep	1904	5 24.5	-24 33	8.5	8.7'		D
50	OCl	Mon	2323	7 3.2	-8 20	7	16.0'		M
42	DfN	Ori	1976	5 35.3	-5 23	5	85' X 60'	Orion	E
43	DfN	Ori	1982	5 35.5	-5 16	7	20' X 15'		M
78	DfN	Ori	2068	5 46.8	0 4	8	8' X 6'		D
46	OCl	Pup	2437	7 41.8	-14 49	6.5	27.0'		M

Spring Diamond

M#	Typ	Con	NGC	H Min	D Min	Mag	Size	Name	Difficulty
44	OCl	Cnc	2632	8 40.1	19 59	4	95.0'	Beehive	E
67	OCl	Cnc	2682	8 50.4	11 49	7.5	30.0'		E
53	GCl	Com	5024	13 12.9	18 10	8.5	12.6'		M
64	Gal	Com	4826	12 56.7	21 41	9	9'x5'	Blackeye	D
85	Gal	Com	4382	12 25.5	18 12	11	7.1' X 5.2'		D
88	Gal	Com	4501	12 32.1	14 26	11	7' X 4'		D
91	Gal	Com	4548	12 35.5	14 30	12	5.4' X 4.4'		D
98	Gal	Com	4192	12 13.9	14 55	11	9.5' X 3.2'		D
99	Gal	Com	4254	12 18.9	14 26	11	5.4' X 4.8'		D
100	Gal	Com	4321	12 23	15 50	11	7' X 6'		D
3	GCl	CVn	5272	13 42.2	28 23	7	16.2'		E
51	Gal	CVn	5194	13 30	47 11	8	11' X 7'	Whirlpool	E
63	Gal	CVn	5055	13 15.8	42 2	8.5	10' X 6'		D
94	Gal	CVn	4736	12 50.9	41 8	9.5	7' X 3'		D
106	Gal	CVn	4258	12 18.9	47 19	9.5	19' X 8'		D
48	OCl	Hya	2548	8 13.8	-5 48	5.5	54.0'		E
68	GCl	Hya	4590	12 39.5	-26 45	9	12.0'		M
83	Gal	Hya	5236	13 37.1	-29 52	8.5	11' X 10'		D
65	Gal	Leo	3623	11 18.9	13 6	11	8' X 1.5'		D
66	Gal	Leo	3627	11 20.2	13 0	10	8' X 2.5'		D
95	Gal	Leo	3351	10 43.9	11 42	11	4.4' X 3.3'		D
96	Gal	Leo	3368	10 46.7	11 49	11	6' X 4'		D
105	Gal	Leo	3379	10 47.8	12 35	11	2.0'		D
49	Gal	Vir	4472	12 29.8	8 1	10	9' X 7.5'		D
58	Gal	Vir	4579	12 37.8	11 50	11	5.5' X 4.5'		D
59	Gal	Vir	4621	12 42.1	11 39	12	5' X 3.5'		D
60	Gal	Vir	4649	12 43.7	11 34	11	7' X 6'		D
61	Gal	Vir	4303	12 22	4 29	11	6' X 5.5'		D
84	Gal	Vir	4374	12 25.1	12 54	11	5.0'		D
86	Gal	Vir	4406	12 26.3	12 57	11	7.5' X 5.5'		D
87	Gal	Vir	4486	12 30.9	12 24	11	7.0'		D
89	Gal	Vir	4552	12 35.7	12 34	12	4.0'		D
90	Gal	Vir	4569	12 36.9	13 10	11	9.5' X 4.5'		D
104	Gal	Vir	4594	12 39.9	-11 37	9.5	9' X 4'	Sombrero	M

Summer Triangle

M#	Typ	Con	NGC	H	Min	D	Min	Mag	Size	Name	Difficulty
29	OCl	Cyg	6913	20	23.9	38	32	9	7.0'		D
39	OCl	Cyg	7092	21	32.2	48	26	5.5	32.0'		E
13	GCl	Her	6205	16	41.7	36	28	7	16.6'		E
92	GCl	Her	6341	17	17.1	43	8	7.5	11.2'		E
56	GCl	Lyr	6779	19	16.6	30	11	9.5	7.1'		M
57	PIN	Lyr	6720	18	53.6	33	2	9.5	1.5'x1'	Ring	D
11	OCl	Sct	6705	18	51.1	-6	16	7	14.0'	Wild Duck	E
26	OCl	Sct	6694	18	45.2	-9	24	9.5	15.0'		M
71	GCl	Sge	6838	19	53.8	18	47	8.5	7.2'		M
27	PIN	Vul	6853	19	59.6	22	43	7.5	8'x6'	Dumbbell	E

Summer Ecliptic

M#	Typ	Con	NGC	H	Min	D	Min	Mag	Size	Name	Difficulty
9	GCl	Oph	6333	17	19.2	-18	31	9	9.3'		M
10	GCl	Oph	6254	16	57.1	-4	6	7.5	15.1'		E
12	GCl	Oph	6218	16	47.2	-1	57	8	14.5'		E
14	GCl	Oph	6402	17	37.6	-3	15	9.5	11.7'		M
19	GCl	Oph	6273	17	2.6	-26	16	8.5	13.5'		M
62	GCl	Oph	6266	17	1.2	-30	7	8	14.1'		M
107	GCl	Oph	6171	16	32.5	-13	3	10	10.0'		D
4	GCl	Sco	6121	16	23.6	-26	32	7.5	26.3'		E
6	OCl	Sco	6405	17	40.1	-32	13	4.5	15.0'	Butterfly	E
7	OCl	Sco	6475	17	53.9	-34	49	3.5	80.0'		E
80	GCl	Sco	6093	16	17	-22	59	8.5	8.9'		M
5	GCl	Ser	5904	15	18.6	2	5	7	17.4'		E
16	C/N	Ser	6611	18	18.8	-13	47	6.5	7.0'	Eagle	E
8	C/N	Sgr	6523	18	3.1	-24	23	5	60' X 35'	Lagoon	E
17	C/N	Sgr	6618	18	20.8	-16	11	7	11.0'	Omega	E
18	OCl	Sgr	6613	18	19.9	-17	8	8	9.0'		M
20	C/N	Sgr	6514	18	2.3	-23	2	5	28.0'	Trifid	M
21	OCl	Sgr	6531	18	4.6	-22	30	7	13.0'		M
22	GCl	Sgr	6656	18	36.4	-29	54	6.5	24.0'		E
23	OCl	Sgr	6494	17	56.8	-19	1	6	27.0'		E
24	OCl	Sgr	6603*	18	18.4	-18	25	12	5.0'		E
25	OCl	Sgr	IC4725	18	28.8	-19	17	4.9	40.0'		E
28	GCl	Sgr	6626	18	24.5	-24	52	8.5	11.2'		E
54	GCl	Sgr	6715	18	55.1	-30	29	8.5	9.1'		M
55	GCl	Sgr	6809	19	40	-30	58	7	19.0'		E
69	GCl	Sgr	6637	18	34.4	-32	21	9	7.1'		M
70	GCl	Sgr	6681	18	43.2	-32	18	9	7.8'		M
75	GCl	Sgr	6864	20	6.1	-21	55	9.5	6.0'		D

Circumpolar

M#	Typ	Con	NGC	H	Min	D	Min	Mag	Size	Name	Difficulty
52	OCl	Cas	7654	23	24.2	61	35	8	13.0'		E
103	OCl	Cas	581	1	33.2	60	42	7	6.0'		M
102	Gal	Dra	5866	15	6.5	55	45	11	5.2' X 2.3'		D
40	Dbl	UMa	WIN4	12	20	58	22	9	49"	Dbl Star	D
81	Gal	UMa	3031	9	55.6	69	4	8.5	21' X 10'		D
82	Gal	UMa	3034	9	55.9	69	41	9 5	9' X 4'		D
97	PIN	UMa	3587	11	14.8	55	1	12	3'	Owl	D
101	Gal	UMa	5457	14	3.3	54	22	8.5	22.0'		M
108	Gal	UMa	3556	11	11.6	55	41	11	8' X 1'		D
109	Gal	UMa	3992	11	57.6	53	23	11	7' X 4'		D

Deep Sky Objects

The Messier objects encompass the faint fuzzy end of deep sky objects. Others being Variable Stars, Double Stars, Stars.

Galaxies are distant objects outside our galaxy, the Milky Way Galaxy. The Andromeda Galaxy is the most distant object we can see with the naked eye at about 2,000,000 light years. Although many galaxies are visible in binoculars and amateur telescopes they can be difficult. The most important thing is to observe them under dark skies, away from city lights and free of moonlight. Determine the exact location by star hopping and use averted vision on the difficult ones.

Open Clusters are usually families of young stars bound together by gravity. They originate from star factories like the Orion Nebula. Some (Plieades, Hyades, etc.) can be seen with the naked eye with many more visible through binoculars. Open clusters have a common proper motion—all heading in the same direction. When observing them note there density, resolvable or not, patterns, interesting doubles or colored stars.

Globular clusters were formed early in the formation of the galaxy and contain very old suns thus there red color in photographs. Their concentration of stars make them spectacular when seen through the telescope, Summer nights are best time for globulars with many found in Sagittarius, Scorpius, Ophiuchus area. Fun Binocular objects also.

Planetary nebulae are shells of gas thrown out by some stars near the end of their lives. Most are difficult with binoculars. When observing with a scope use an OIII filter and higher powers.

Diffuse nebulae like the Orion Nebula are huge clouds of gases inside which stars are born. In Messiers they reside in Orion and Srg. Note the ones in Sgr are listed as Cluster Nebula where part of the stars have already been born!