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## Saber Does The Stars

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**Stephen Saber (SaberScorpX)**



Stephen Saber has been an avid observational astronomer for many years. A musician and songwriter by trade, his passion for the night sky has led him to star parties and celestial events in 30 states, Canada, Mexico, and the Carribean. His astronomy articles have appeared in numerous regional and national publications. Saber is also the author of the *Starhoppers Guide to the Herschel 400* and namesake of the lunar phase phenomenon known as *Saber's beads*. His extensive outreach efforts inspired the first permanent camp observatory built for the Boy Scouts of America. Saber has received the Master Observer's award from the Astronomical League and is currently a member of the Quad

Cities Popular Astronomy Club.

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Also see *Saber Does The Stars (Vol 2: the Index Catalog)* at <http://www.c14isawesome.blogspot.com>

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## **Running the M-Cubed (Messier Marathon from Memory)** **Stephen Saber**



Running the M-Cubed is an advanced approach to the Messier Marathon requiring the observer to already be very familiar with each target's position. Sharpshooting the Messiers for a few seasons before even hearing of the M-Cubed, my approach included committing the entire sequence to memory. For easier memorization the 110 Messier objects are broken down into 10 groups, each corresponding to a specific area of the sky. Numeric patterns are added whenever possible while still following the basic search sequence. I have used this technique to manually hunt and observe all 110 Messiers from Arizona, and 109 on four occasions from 41°N latitude without the aid of starcharts, notes, or red light. Very liberating.

Begin by memorizing the first string of numbers while visualizing their positions. As you become comfortable with these, repeat the process for the subsequent groups.

### *Evening Rush*

74, 77, 33, 31, 32, 110, 52, 103, 76, 34, 45

### *Southern Comfort*

79, 42, 43, 78, 50, 41, 93, 46, 47, 48

### *Early Ecliptic*

1, 35, 37, 36, 38, 44, 67, 95, 96, 105, 65, 66

### *The Big Bear*

81, 82, 97, 108, 109, 40, 106, 94, 63, 51, 101, 102

### *Downtown Virgo*

98, 99, 100, 85, 84, 86, 87, 88, 91, 90, 89

### *Virgo and the 'Burbs*

58, 59, 60, 49, 61, 64, 53, 3, 104, 68, 83

### *Easy East*

5, 13, 92, 57, 56, 39, 29, 27, 71

### *Got Globulars?*

12, 10, 14, 107, 9, 4, 80, 62, 19

### *Cruising the Milky Way*

11, 26, 16, 17, 18, 24, 25, 23, 21, 20, 8, 28, 22

### *Homestretch*

6, 7, 69, 70, 54, 55, 75, 15, 2, 72, 73, 30

With repetition the individual strings will eventually link together as the entire search sequence is committed to memory. (note: the strings' titles are by no means written in stone, and can be substituted for any phrase the observer finds mnemonically helpful. also, the classic m-cubed only requires memorization of the target

positions- not the search sequence.)

I encourage those interested in attempting this method to practice with mini-M-Cubes throughout the year, going over each leg in sections.

Many end up suprised by the number of object locations that are already familiar outside of their chart and starhopping routine.

*[Left Ascension, Feb '04]*

(Photo credit: SEDS)

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## **Concordium Borealis** **Stephen Saber**

*This collection of DSOs and doublestars unifies the Astronomical League's Messier, Bino Deepsky, Caldwell (the 76 most northern), and Double Star targets as well as the RASC's 110 Finest NGC Objects (90 of which are Herschel 400s). Three doubles I couldn't live without are also included.*

*Designed with those tackling the Observe Programs in mind, the overlapping entries have been omitted- leaving a treasure chest of 400+ gems for northern observers.*

*Grouped by constellation, the basic data and corresponding Pocket Sky Atlas chart follow each entry.*

### ANDROMEDA type/mag/radec/psa

M31 GX 3.5 0043+4119 03  
M32 GX 8.2 0043+4055 03  
M110 GX 8.0 0041+4144 03  
C28/NGC752 OC 5.7 0158+3743 02  
C23/NGC891 GX 10.0 0223+4223 02  
C22/NGC7662 PN 9.0 2326+4236 03  
gammaAnd DS 2.3 0204+4222 02

### AQUARIUS

M2 GC 6.5 2134-0047 77  
M72 GC 9.4 2054-1230 77  
M73 AS 9.0 2059-1236 77  
C55/NGC7009 PN 8.0 2105-1120 77  
C63/NGC7293 PN 7.5 2230-2046 76  
zetaAqr DS 4.3 2229-0001 77  
94 Aqr DS 5.3 2319-1328 76

### AQUILA

NGC6709 OC 6.7 1852+1022 65  
NGC6781 PN 12.0 1919+0634 65  
57 Aql DS 5.8 1955-0814 66

### ARIES

NGC772 GX 10.3 0200+1903 04  
gammaAri DS 4.8 0154+1918 04  
lambdaAri DS 4.9 0158+2336 04

## AURIGA

M36 OC 6.0 0537+3408 12  
M37 OC 5.6 0553+3233 12  
M38 OC 6.4 0529+3550 12  
NGC1893 OC 7.5 0523+3324 12  
NGC1907 OC 8.2 0529+3519 12  
NGC1931 CN 11.3 0532+3415 12  
NGC2281 OC 5.4 0650+4103 23  
C31/IC405 EN — 0517+3416 12  
thetaAur DS 2.7 0600+3713 12

## BOOTES

C45/NGC5248 GX 10.2 1338+0851 44  
NGC5466 GC 9.1 1406+2830 44  
deltaBoo DS 3.5 1516+3319 42  
iotaBoo DS 4.9 1416+5122 42  
kappaBoo DS 4.6 1414+5147 42  
epsilonBoo DS 2.5 1445+2704 44  
muBoo DS 4.3 1525+3723 42  
piBoo DS 4.9 1441+1625 44  
xiBoo DS 4.7 1451+1906 44

## CAMELOPARDALIS

NGC1501 PN 13.0 0408+6056 13  
C7/NGC2403 GX 8.4 0738+6535 21  
NGC2655 GX 10.1 0857+7811 21  
C5/IC342 GX 9.1 0348+6807 11  
Stock23 OC 6.5 0316+6002 11  
Kemble1 OC 4.0 0358+6306 11  
1 Cam DS 5.7 0432+5355 12  
32 Cam DS 5.3 1249+8325 21

## CANCER

M44 OC 3.1 0841+1957 24  
M67 OC 6.9 0851+1147 24  
C48/NGC2775 GX 10.3 0911+0700 24  
iotaCnc DS 4.2 0847+2846 24  
zetaCnc DS 5.5 0812+1739 24

## CANES VENATICI

M3 GC 6.3 1343+2821 44  
M51 GX 8.4 1330+4710 43  
M63 GX 8.6 1316+4159 43  
M94 GX 8.2 1251+4104 43  
M106 GX 8.3 1219+4715 43  
NGC4111 GX 10.8 1208+4301 43  
NGC4214 GX 9.7 1216+3617 43  
C26/NGC4244 GX 10.2 1218+3746 43  
C21/NGC4449 GX 9.4 1229+4403 43

NGC4490 GX 9.8 1231+4135 43  
C32/NGC4631 GX 9.3 1242+3229 43  
NGC4656/7 GX 10.4 1244+3207 43  
C29/NGC5005 GX 9.8 1311+3700 43  
NGC5033 GX 10.1 1314+3633 43  
alphaCVn DS 2.9 1256+3819 43

#### CANIS MAJOR

M41 OC 4.5 0646-2045 27  
NGC2359 EN 11.0 0719-1313 27  
C58/NGC2360 OC 7.2 0718-1538 27  
C64/NGC2362 OC 4.1 0719-2457 27  
epsilonCMa DS 1.5 0659-2858 27  
h3945 DS 5.0 0717-2318 27

#### CAPRICORNUS

M30 GC 7.5 2141-2309 77  
alphaCap DS 3.6 2018-1233 66  
betaCap DS 3.4 2021-1447 66

#### CASSIOPEIA

M52 OC 6.9 2325+6138 03  
M103 OC 7.4 0134+6044 03  
NGC129 OC 6.5 0030+6017 03  
C17/NGC147 GX 9.3 0034+4833 03  
C18/NGC185 GX 9.2 0039+4823 03  
NGC281 EN 7.0 0053+5640 03  
C13/NGC457 OC 6.4 0120+5823 03  
C8/NGC559 OC 9.5 0130+6320 01  
C10/NGC663 OC 7.1 0147+6117 01  
C11/NGC7635 EN — 2321+6115 71  
NGC7789 OC 6.7 2357+5647 03  
IC289 PN 13.1 0311+6121 02  
Cr463 OC 5.7 0148+7157 01  
Stock2 OC 4.4 0215+5916 01  
Mark6 OC 7.1 0230+6039 01  
Mel15 OC 6.5 0233+6127 01  
Tr3 OC 7.0 0312+6315 01  
etaCas DS 3.4 0049+5749 03  
iotaCas DS 4.0 0229+6724 01  
sigmaCas DS 5.0 2359+5545 03

#### CEPHEUS

C2/NGC40 PN 11.0 0013+7235 71  
C1/NGC188 OC 8.1 0045+8523 71  
NGC6939 OC 7.8 2032+6040 61  
C12/NGC6946 GX 8.9 2035+6011 61  
C4/NGC7023 CN 7.0 2101+6812 71  
NGC7129 RN 12.0 2141+6608 71  
NGC7160 OC 6.1 2154+6238 71

NGC7235 OC 7.7 2213+5719 71  
C9/Sh2-155 DN — 2257+6237 71  
betaCep DS 3.2 2129+7034 71  
deltaCep DS 3.9 2229+5825 71  
xiCep DS 4.4 2204+6438 71  
Struve 2816 DS 5.6 2139+5729 73

## CETUS

M77 GX 8.8 0243+0001 04  
C56/NGC246 PN 8.0 0047-1150 07  
C62/NGC247 GX 8.9 0047-2043 07  
NGC936 GX 10.1 0228-0107 04  
C51/IC1613 GX 9.3 0105+0207 05  
gammaCet DS 3.5 0243+0314 04

## COLUMBA

C73/NGC1851 GC 7.3 0514-4003 18

## COMA BERENICES

M53 GC 7.7 1313+1807 45  
M64 GX 8.5 1257+2138 45  
M85 GX 9.2 1226+1808 C  
M88 GX 9.5 1232+1422 C  
M91 GX 10.2 1236+1427 C  
M98 GX 10.1 1214+1451 C  
M99 GX 9.8 1219+1422 C  
M100 GX 9.4 1223+1546 C  
NGC4274 GX 10.4 1220+2934 45  
NGC4414 GX 10.3 1227+3110 45  
NGC4494 GX 9.9 1232+2544 45  
C36/NGC4559 GX 9.9 1236+2755 45  
C38/NGC4565 GX 9.6 1237+2556 45  
NGC4725 GX 9.2 1251+2527 45  
C35/NGC4889 GX 11.4 1300+2755 45  
Mel 111 OC 1.8 1225+2600 45  
24 Com DS 5.2 1235+1823 45

## CORONA AUSTRALIS

C68/NGC6729 EN 9.7 1902-3657 69

## CORONA BOREALIS

zetaCrB DS 5.1 1539+3638 53  
sigmaCrB DS 5.6 1615+3352 53

## CORVUS

C60/NGC4038 GX 10.7 1202-1855 47  
C61/NGC4039 GX 13.0 1202-1856 47  
NGC4361 PN 10.0 1225-1851 47

deltaCrv DS 3.0 1230-1631 47

## CYGNUS

M29 OC 6.6 2024+3834 62

M39 OC 4.6 2132+4828 62

NGC6819 OC 7.3 1942+4012 62

C15/NGC6826 PN 10.0 1945+5032 62

C27/NGC6888 EN 7.5 2012+3822 62

NGC6910 OC 7.4 2023+4049 62

C34/NGC6960 SN — 2046+3045 62

C33/NGC6992-5 SN — 2057+3145 62

C20/NGC7000 EN 6.0 2059+4422 62

NGC7027 PN 10.0 2107+4216 62

NGC7063 OC 7.0 2125+3632 62

C19/IC5146 CN 10.0 2154+4718 73

betaCyg DS 3.1 1931+2758 62

31 Cyg DS 3.8 2014+4644 62

61 Cyg DS 5.2 2107+3845 62

## DELPHINUS

C47/NGC6934 GC 8.7 2034+0724 64

C42/NGC7006 GC 10.6 2102+1611 64

gammaDel DS 4.5 2047+1607 64

## DRACO

M102 GX 10.0 1507+5544 42

C3/NGC4236 GX 9.7 1217+6928 41

NGC5907 GX 10.4 1516+5619 42

NGC6503 GX 10.2 1749+7009 61

C6/NGC6543 PN 8.8 1759+6638 51

muDra DS 5.7 1705+5428 52

nuDra DS 4.9 1732+5511 52

psiDra DS 4.9 1742+7209 51

16/17 Dra DS 5.4 1636+5255 52

40/41 Dra DS 5.7 1800+8000 51

## ERIDANIS

NGC1232 GX 9.9 0310-2035 17

NGC1535 PN 10.4 0414-1244 17

32 Eri DS 4.8 0354-0257 17

55 Eri DS 6.7 0444-0848 16

## FORNAX

C67/NGC1097 GX 9.2 0246-3017 06

## GEMINI

M35 OC 5.1 0609+2420 25  
NGC2158 OC 8.6 0608+2406 25  
NGC2371/2 PN 11.0 0726+2929 25  
C39/NGC2392 PN 9.9 0729+2055 25  
alphaGem DS 1.9 0735+3153 25  
deltaGem DS 3.5 0720+2159 25

## HERCULES

M13 GC 5.9 1642+3627 52  
M92 GC 6.5 1717+4307 52  
NGC6210 PN 9.0 1645+2348 54  
alphaHer DS 3.5 1715+1423 52  
deltaHer DS 3.1 1715+2450 54  
kappaHer DS 5.3 1608+1703 55  
rhoHer DS 4.6 1724+3709 52  
95 Her DS 5.0 1802+2136 54

## HYDRA

M48 OC 5.8 0814-0549 26  
M68 GC 8.2 1240-2648 47  
M83 GX 7.6 1337-2954 47  
C59/NGC3242 PN 8.6 1025-1838 37  
C66/NGC5694 GC 10.2 1440-2632 46  
N Hya DS 5.8 1132-2916 36

## LACERTA

NGC7209 OC 7.7 2205+4630 73  
C16/NGC7243 OC 6.4 2215+4953 73  
8 Lac DS 5.7 2236+3938 72

## LEO

M65 GX 9.3 1119+1302 34  
M66 GX 9.0 1121+1256 34  
M95 GX 9.7 1044+1139 34  
M96 GX 9.2 1047+1146 34  
M105 GX 9.3 1048+1232 34  
NGC2903 GX 8.9 0933+2128 35  
NGC3384 GX 10.0 1049+1235 34  
NGC3521 GX 8.9 1106-0005 34  
NGC3607 GX 10.0 1117+1800 34  
C40/NGC3626 GX 10.9 1121+1818 34  
NGC3628 GX 9.5 1121+1333 34  
alphaLeo DS 1.4 1008+1158 35  
gammaLeo DS 2.2 1020+1951 35  
54 Leo DS 4.5 1056+2445 34

## LEO MINOR



NGC3003 GX 11.7 0949+3323 33  
NGC3344 GX 10.0 1044+2452 35  
NGC3432 GX 11.3 1023+3634 33

## LEPUS

M79 GC 8.0 0525-2433 16  
HR1944 DS 6.4 0539-1751 16  
gammaLep DS 3.8 0545-2227 16

## LIBRA

NGC5897 GC 8.6 1518-2103 57  
alphaLib DS 2.8 1451-1602 57

## LYNX

C25/NGC2419 GC 10.4 0739+3852 23  
NGC2683 GX 9.7 0853+3323 22  
12 Lyn DS 5.4 0646+5927 23  
19 Lyn DS 5.6 0723+5517 23  
38 Lyn DS 3.9 0919+3648 22

## LYRA

M56 GC 8.3 1917+3012 63  
M57 PN 9.0 1854+3303 63  
betaLyr DS 3.4 1850+3322 63  
zetaLyr DS 4.3 1845+3736 63  
epsilonLyr DS 5.0 1844+3940 63  
Struve 2404 DS 6.9 1851+1059 63  
O.Struve 525 DS 6.0 1855+3358 63

## MONOCEROS

M50 OC 5.9 0704-0821 27  
NGC2232 OC 3.9 0627-0445 27  
C50/NGC2244 OC 4.8 0633+0452 25  
NGC2251 OC 7.3 0635+0822 25  
C46/NGC2261 EN 10.0 0639+0844 25  
NGC2264 CN 3.9 0642+0952 25  
C49/NGC2237+ EN — 0631+0503 25  
NGC2301 OC 6.0 0652+0027 25  
NGC2343 OC 6.7 0709-1040 27  
C54/NGC2506 OC 7.6 0801-1048 26  
betaMon DS 4.7 0629-0702 27  
epsilonMon DS 4.5 0624+0436 25

## OPHIUCHUS

M9 GC 7.9 1720-1831 56  
M10 GC 6.6 1658-0126 56  
M12 GC 6.6 1648-0158 56  
M14 GC 7.6 1738-0315 56

M19 GC 7.2 1703-2617 56  
M62 GC 6.6 1702-3008 56  
M107 GC 8.1 1633-1304 56  
NGC6369 PN 13.0 1730-2346 56  
NGC6572 PN 9.0 1812+0651 65  
NGC6633 OC 4.6 1828+0634 65  
IC4665 OC 4.2 1746+0543 54  
omicronOph DS 5.4 1718-2417 56  
36 Oph DS 5.1 1715-2636 56  
70 Oph DS 4.2 1806+0230 65

## ORION

M42 EN 3.9 0536-0527 16  
M43 EN 9.0 0536-0516 16  
M78 RN 8.0 0547+0003 16  
NGC1662 OC 6.4 0449+1057 14  
NGC1788 RN — 0507-0320 16  
NGC1973+ EN — 0535-0444 B  
NGC1981 OC 4.6 0536-0426 16  
NGC2022 PN 12.0 0543+0905 14  
NGC2024 EN — 0542-0151 14  
NGC2169 OC 5.9 0609+1357 14  
NGC2194 OC 8.5 0614+1248 14  
betaOri DS 0.1 0515-0812 16  
deltaOri DS 2.2 0532-0018 16  
theta1 Ori DS 5.4 0536-0523 B  
theta2 Ori DS 5.2 0536-0525 B  
iotaOri DS 2.8 0535-0555 B  
lambdaOri DS 3.6 0535+0956 14  
sigmaOri DS 4.0 0539-0236 16  
zetaOri DS 1.9 0541-0157 16  
Struve 747 DS 4.8 0535-0600 B

## PEGASUS

M15 GC 6.4 2130+1212 75  
C30/NGC7331 GX 9.5 2237+3427 72  
C44/NGC7479 GX 11.0 2305+1222 74  
C43/NGC7814 GX 10.5 0004+1612 74  
epsilonPeg DS 2.4 2144+0952 75

## PERSEUS

M34 OC 5.2 0243+4249 13  
M76 PN 12.0 0143+5136 13  
C14/NGC869 OC 4.0 0220+5711 13  
C14/NGC884 OC 4.0 0223+5709 13  
NGC1023 GX 9.5 0241+3906 13  
C24/NGC1275 GX 11.6 0320+4133 13  
NGC1342 OC 6.7 0332+3722 13  
NGC1491 EN — 0404+5120 13  
NGC1528 OC 6.4 0416+5115 13

NGC1582 OC 7.0 0433+4352 12  
Tr2 OC 5.9 0237+5559 13  
Mel20 OC 1.2 0322+4900 13  
etaPer DS 3.8 0251+5554 13  
Struve 331 DS 5.3 0301+5221 13

## PISCES

M74 GX 9.2 0137+1549 04  
alphaPsc DS 4.2 0202+0246 04  
zetaPsc DS 5.6 0113+0735 05  
psi1 Psc DS 5.6 0106+2128 05  
65 Psc DS 6.3 0050+2743 05

## PUPPIS

M46 OC 6.1 0742-1450 27  
M47 OC 4.4 0737-1431 27  
M93 OC 6.2 0745-2353 26  
NGC2440 PN 11.0 0742-1814 26  
C71/NGC2477 OC 5.8 0753-3834 28  
NGC2527 OC 6.5 0806-2811 28  
NGC2539 OC 6.5 0811-1251 26  
NGC2571 OC 7.0 0819-2946 28  
kappaPup DS 4.5 0739-2648 27

## SAGITTA

M71 GC 8.3 1954+1848 64

## SAGITTARIUS

M8 CN 5.8 1804-2423 67  
M17 EN 6.0 1821-1611 67  
M18 OC 6.9 1820-1708 67  
M20 EN 6.3 1803-2302 67  
M21 OC 5.9 1805-2635 67  
M22 GC 5.1 1837-2354 67  
M23 OC 5.5 1757-1901 67  
M24 SC 4.6 1817-1850 67  
M25 OC 4.6 1832-1915 67  
M28 GC 6.9 1825-2452 67  
M54 GC 7.7 1856-3028 67  
M55 GC 7.0 1940-3057 66  
M69 GC 7.7 1832-3221 67  
M70 GC 8.1 1844-3217 67  
M75 GC 8.6 2007-2154 66  
NGC6445 PN 13.0 1750-2001 67  
NGC6520 OC 8.0 1804-2754 67  
NGC6716 OC 6.9 1855-1952 67  
NGC6818 PN 10.0 1944-1408 66  
C57/NGC6822 GX 9.0 1945-1447 66

## SCORPIUS

M4 GC 5.9 1624-2633 56  
M6 OC 4.2 1741-3213 58  
M7 OC 3.3 1754-3449 58  
M80 GC 7.2 1617-2300 56  
C75/NGC6124 OC 5.8 1626-4041 58  
C76/NGC6231 OC 2.6 1654-4148  
C69/NGC6302 PN 13.0 1714-3707 58  
betaSco DS 2.6 1605-1948 56  
nuSco DS 4.3 1612-1928 56  
xiSco DS 4.8 1604-1122 56  
Struve 1999 DS 7.4 1604-1127 56

## SCULPTOR

C72/NGC55 GX 8.0 0015-3908 78  
C65/NGC253 GX 7.1 0048-2514 07  
C70/NGC300 GX 9.0 0055-3738 09

## SCUTUM

M11 OC 5.8 1852-0615 67  
M26 OC 8.0 1846-0923 67  
NGC6712 GC 8.2 1854-0841 67

## SERPENS CAPUT

M5 GC 5.8 1519+0203 55  
deltaSer DS 4.2 1535+1032 55

## SERPENS CAUDA

M16 CN 6.0 1819-1347 67  
IC4756 OC 4.6 1839+0527 65  
thetaSer DS 4.5 1856+0412 65

## SEXTANS

C53/NGC3115 GX 9.2 1006-0745 37

## TAURUS

M1 SN 8.4 0535+2201 14  
M45 OC 1.2 0047+2407 15  
NGC1514 PN 10.0 0410+3048 15  
NGC1647 OC 6.4 OC 0446+1905 15  
NGC1746 OC 6.0 0504+2350 14  
NGC1807 OC 7.0 0511+1633 14  
NGC1817 OC 7.7 0513+1643 14  
C41/Mel25 OC 1.0 0427+1600 15  
chiTau DS 5.5 0423+2538 15  
118 Tau DS 5.8 0529+2509 14

## TRIANGULUM

M33 GX 5.7 0134+3041 02  
iotaTri DS 5.3 0212+3018 02

#### URSA MAJOR

M40 DS 9.0 1222+5805 32  
M81 GX 6.9 0956+6902 31  
M82 GX 8.4 0956+6939 31  
M97 PN 11.2 1115+548 32  
M101 GX 7.7 1403+5419 42  
M108 GX 10.1 1112+5537 32  
M109 GX 9.8 1158+5320 32  
NGC2841 GX 9.3 0923+5056 33  
NGC3079 GX 10.6 1003+5539 33  
NGC3184 GX 9.8 1019+4123 33  
NGC3877 GX 12.0 1147+4727 32  
NGC3941 GX 11.0 1153+3656 32  
NGC4026 GX 12.0 1200+5055 32  
NGC4088 GX 10.5 1206+5030 32  
NGC4157 GX 12.0 1212+5026 32  
NGC4605 GX 11.0 1240+6134 32  
zetaUMa DS 2.3 1324+5456 32

#### URSA MINOR

alphaUMi DS 2.0 0232+8916 01

#### VELA

C74/NGC3132 PN 8.2 1008-4026

#### VIRGO

M49 GX 8.4 1230+0757 C  
M58 GX 9.8 1238+1146 C  
M59 GX 9.8 1242+1136 C  
M60 GX 8.8 1244+1130 C  
M61 GX 9.7 1222+0425 45  
M84 GX 9.3 1226+1250 C  
M86 GX 9.2 1227+1254 C  
M87 GX 8.6 1231+1221 C  
M89 GX 9.8 1236+1230 C  
M90 GX 9.5 1237+1307 C  
M104 GX 8.3 1240-1140 47  
NGC4216 GX 10.0 1216+1306 C  
NGC4388 GX 11.1 1226+1237 C  
NGC4438 GX 10.1 1228+1258 C  
NGC4517 GX 10.5 1233+0004 45  
NGC4526 GX 9.6 1234+0739 C  
NGC4535 GX 9.8 1235+0809 C  
NGC4567/8 GX 11.3 1237+1112 C  
C52/NGC4697 GX 9.3 1249-0551 47  
NGC4699 GX 9.6 1249-0843 47

NGC4762 GX 10.2 1253+1111 C  
NGC5746 GX 10.6 1445+0155 44  
gammaVir DS 3.5 1242-0127 45

## VULPECULA

M27 PN 8.1 2000+2244 64  
NGC6802 OC 8.8 1931+2017 64  
NGC6823 CN 7.1 1943+2319 64  
C37/NGC6882-5 OC 6.0 2012+2630 64  
NGC6940 OC 6.3 2035+2820 64  
Cr 399 OC 3.6 1925+2011 64

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### Observatories: The Thunderdome



‘Observatory Dedicated to Boy Scouts of America’  
(June 1998, BSA)

For the past three years, amateur astronomers Stephen Saber and Gene Evans have been showing the wonders of the night sky to visitors at the Loud Thunder Illowa Scout Camp and Forest Preserve in Illinois City, IL.

June and July alone see more than 2,000 Scouts from across the nation (and overseas) pass through the camp, and each are given the opportunity to view the Moon, planets, and distant galaxies through telescopes and binoculars.

The response was so well received that the HON corporation in Muscatine, Iowa funded the construction of a permanent astronomical observatory at the camp, the first specifically dedicated for use by the Boy Scouts of America.

In keeping with the forest preserve’s Native American roots, the observatory was named *Akotah Kanikamocik Acahkosak* (The Place of Singing Stars).

Operated and maintained by Saber and Evans, the automated dome houses a 14-inch Schmitt-Cassegrain telescope, and is available for all visiting Scout troops and their families.

*[Despite my efforts and research to poetically name the observatory, it wasn’t too suprising that the visiting Scouts almost immediately dubbed it the ‘Thunderdome’ (and I, accordingly, became ‘Mad Max’). -Saber]*

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### Stellar Reactions: Tales From The Eyepiece Stephen Saber

Starparties are more than just our chance to combine forces collecting photons, converse with friends, and show-off our new astro toys. Veterans also have the chance to flex their expertise as celestial tour guides for the visiting public.

And after offering thousands of visitors their first up-close glimpses of the heavens, I’d like to share some of my personal favorite laymans’ reactions at the eyepiece.

**HELIOPHOBIA:** It was a beautiful day for Solar observing among the Red Rocks of Arizona. I had a long line forming behind my mounted and filtered 80mm giant binos. But a middle-aged woman ‘on deck’ was becoming increasingly reluctant despite the safety reassurances from me and those of her family that had already taken a

peek. Without warning, her panic attack erupted with accompanying hysterical ranting about a possible intimate view of our star 'invading her spirit' and 'stealing her soul'. She ran from the line and spent the next 10 minutes waiting for the rest of her family crouched in fear and peering from behind a nearby building.

**HAVE YOU HUGGED AN ASTROLOGER TODAY?:** Mighty Jove never fails to make an impression with newbies. After taking a long look with praise and awe at Jupiter, an excited woman began gushing me with thanks and multiple bearhugs. Turns out she was an avid astrologer who had never had the chance to see her favorite planet 'live' among her birthsign's stars. She was so appreciative that I didn't have the heart to explain that Jupiter was nowhere near the constellation she had hoped.

**LUNAR VERTIGO:** A young lady in line for her first telescopic view of our moon got a bit more than she expected. That night, for kicks, I was employing the porthole effects of a 16mm Nagler. After about ten mesmerized seconds she managed a quiet and appreciative "Whoa". At almost the same time her knees slowly buckled. She fell onto my accessories table while still clutching the now teetering scope's diagonal. Fortunately my reflexes and moral priorities were on keel that night as I grabbed both the woman's arm and my tripod almost simultaneously, narrowly avoiding certain disaster. (Those Naglers should really come with a physiological warning!)

**A SATURNIAN COMA:** Saturn looked great that night. I was even envious that this massive group of Cub Scouts was going to enjoy such an incredibly crisp view of our ringed planet at only their first opportunity. In fact, an eager Scout about fifth in line was so literally floored by his view that he fell backwards into the grass and laid quietly mumbling "Oh God, Oh God, Oh God..." while blankly staring at the heavens for at least the next ten minutes. Not only was it amusing, but he made a great skill for those now anxiously waiting in my line.

**IT TAKES A STEADY HAND:** Back in the day, I used to whip out my red laser pointer at Outreach events to secretly coincide with Mir passes and Iridium flares.

Inevitably, one of the first questions asked was how far the beam would reach, to which I'd respond, "Pretty far. In fact, there are plenty of satellites above us in orbit (casually scanning the skies with the pointer), and sometimes you can catch them (aiming more intently now) at just the right angle and..."  
(-7 mag Iridium flare erupts amidst gasps and cheers of amazement).

[Note: Due to recent public GLP misuse and to promote responsible laser use, I no longer perform this 'magic' light show.

But it was quite a crowd pleaser!]

**GEE! NO, G.E.!:** I overheard the story of a Boy Scout camp offering the Astronomy merit badge to any hardy souls who could stay up late enough for the entire viewing session. The instructor had trained his scope on a bright planet (presumably Venus) just cresting the ridge across a valley. After the group had a look, he moved on to other objects for a few hours. Toward the end of the session, he returned to the planet they'd viewed earlier. Oddly enough, the luminous object appeared no higher in the sky than it had hours earlier. And on closer inspection, he noticed that it was in fact slightly below the ridge line on the far side of the valley. At that point the instructor realized he'd been training the scope on a street light.

At the end of that week of camp, the staff presented him with a plaque bearing a light bulb to commemorate the discovery of his new planet dubbed 'G.E.' (for General Electric).

**WE DON'T NEED NO STEENKING EYEPIECES:** Some folks just can't wait to get their first intimate views of the night sky. In a recent story of enthusiasm meeting confusion, I hadn't even mounted my giant binos before an excited elderly gentleman first in line eagerly attempted a peek at the Pleiades thru my tripod boom arm's stock.

He was so thoroughly chastized for this faux pas by his overbearing wife that I sympathetically passed on chiding him with "So, how was the view?"

**MOON, SCHMOON:** As part of a local elementary school's science fair, I was invited to bring my 8" SCT to share views of our moon and available planets.

Unfortunately, it decided to rain that evening.

Switching to Plan B, I set-up in the gymnasium and taped a blown-up 18" photo of our gibbous moon (laminated and cut round for just such an occasion) high above the bleachers at the opposite end of the gym. Although the angle of my diagonal merely misled most folks as to location of the substitute-moon, one suspicious 3rd grader wasn't buying any part of this astronomical charade stating, "How can that be the Moon? I was just outside and couldn't see it at all through the clouds!"

He did not, however, seem to have a problem believing my scope was capable of first penetrating the building's ceiling.

#### **FROM THE PUBLIC SOLAR COMPLAINTS DEPT.**

"If it's so dangerous to look at the eclipse, then why are they having one at all?"

"Why do we have Daylight Savings Time? That extra hour of sunlight is killing my grass."

"Me and my class cannot make it to the Solar Eclipse on Wednesday. Can you reschedule it?"

**EYE OF THE BEHOLDER:** A line of elementary school students, along with some of the faculty, were taking turns at my scope viewing the available sunspots. After taking a peek, one exceptional 2nd grader began calmly explaining this Solar phenomenon to his nearby classmates. He recited perfectly facts concerning umbras and penumbras, surface temperature differences, approximate sizes of sunspots, as well as Sol's diameter and rotational period.

This was in some contrast to the next sunspot observer, the school's principal, who excitedly spun toward me from the eyepiece and simply exclaimed, "Wow! They look like ants!"

**VICTORY SPIKE FOR VENUS:** I was asked to host a daytime observing session at a nearby youth summer camp. Luckily, conditions were wonderful and the cloudless sky was about as blue as it gets in the Midwest. Hundreds of people had the opportunity to view Sol and Luna.

After lunch, Venus had also climbed high enough in the sky to make it an unscheduled but viable target. Among the first batch of afternoon campers, it was this group's adult counselor that was most excited that another planet might actually be observable during daylight hours. Upon seeing the admittedly pretty but featureless crescent of our sister planet for the first time, she began a touchdown-worthy dance around my scope. The 90 lb. woman's tirade included ecstatic screams and culminated with her falling to her knees and repeatedly pounding tiny fists into the ground.

(And to think I was just gonna stick to sunspots and craters!)

Of course, extreme reactions from views of our celestial treasures are always entertaining. But vicariously seeing the wonders above through a first-timers eyes should also always remind us- lest we take them for granted- of how beautiful, intriguing, and awe-inspiring the Cosmos and its aesthetics truly are.

*Stephen Saber has received the Master Observer's award from the Astronomical League and is author of the 'Starhoppers Guide to the Herschel 400'.*

*He curses the clouds from his home in Rock Island, Illinois.*

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**Herschel II Program Search Sequences**  
**Stephen Saber**



Did you know that depriving large-aperture scopes of their full deepsky potential is the #2 cause of cloudy nights? Probably not. I just made it up. Anyway, this should help take most of the gruntwork out of preparing for the Astronomical League's ultimate fuzzy hunt.

Your Lightbucket is still hungry.  
Feed it Herschel IIs.

## **TARGET DISTRIBUTION AND MIDNIGHT CULMINATION DATES FOR THE H II CONSTELLATIONS**

CMA (4 targets) JAN 2  
GEM (3) JAN 5  
MON (13) JAN 5  
PUP (5) JAN 8  
LYN (4) JAN 19  
SEX (1) FEB 22  
LMI (4) FEB 23  
LEO (20) MAR 1  
UMA (39) MAR 11  
CRT (9) MAR 12  
HYA (13) MAR 15  
CRV (2) MAR 28  
COM (19) APR 2  
CVN (16) APR 7  
VIR (62) APR 11  
BOO (12) MAY 2  
LIB (9) MAY 9  
DRA (11) MAY 24  
SER (3) JUN 6  
HER (7) JUN 13  
SGR (4) JUL 7  
AQL (3) JUL 16  
VUL (2) JUL 25  
CYG (11) JUL 30  
CAP (1) AUG 8  
AQR (6) AUG 25  
LAC (1) AUG 28  
PEG (13) SEP 1  
SCL (2) SEP 26  
PSC (15) SEP 27  
CEP (7) SEP 29  
AND (4) OCT 9  
CAS (2) OCT 9  
CET (15) OCT 15  
TRI (5) OCT 23  
ARI (3) OCT 30  
PER (13) NOV 7  
ERI (17) NOV 10  
TAU (3) NOV 30  
ORI (8) DEC 11

LEP (3) DEC 14  
AUR (3) DEC 21  
CAM (3) DEC 23

## NGC SEARCH SEQUENCES BY CONSTELLATION

ANDROMEDA  
7640 206 214 513

AQUARIUS  
7184 7218 7171 7377 7392 7600

AQUILA  
6814 6772 6804

ARIES  
821 1156 1012

AURIGA  
1883 1778 2192

BOOTES  
5520 5660 5687 5582 5533 5529 5590 5899  
5523 5548 5490 5600

CAMELOPARDALIS  
2253 2347 2366

CANES VENATICI  
4248 4220 4217 4369 4244 4138 4395 4914  
4956 5023 5103 5440 5444 5445 5371 5383

CANIS MAJOR  
2283 2367 2359 2374

CAPRICORNUS  
6907

CASSIOPEIA  
7635 896

CEPHEUS  
7023 7129 7139 7354 7419 7762 1184

CETUS  
175 217 151 337 357 636 428 991 1045  
1035 1032 1073 1087 1090 1070

COMA BERENICES  
4237 4152 4212 4189 4298 4302 4312 4379  
4340 4336 4571 4185 4169 4136 4310 4359  
5056 5012 5053

CORVUS  
4024 4039

CRATER

3513 3511 3693 3732 3672 3636 3637 3892  
3887

CYGNUS

6894 6857 6888 6960 6992 6824 6991 6997  
7031 7067 7082

DRACO

3682 4133 4236 4250 4256 4291 4319 5879  
5985 6015 6340

ERIDANIS

1187 1114 1172 1199 1209 1162 1325 1332  
1353 1400 1421 1507 1600 1618 1637 1700  
1779

GEMINI

2274 2331 2339

HERCULES

6106 6181 6166 6058 6155 6239 6548

HYDRA

2610 2781 2855 2889 2784 2765 2986 3078  
3145 3585 4105 5061 5078

LACERTA

7245

LEO

3107 3177 3162 3301 3274 3338 3596 3605  
3599 3507 3681 3659 3067 3646 3689 3524  
3547 3666 3705 3611

LEO MINOR

3254 3430 3424 3158

LEPUS

1832 2139 2196

LIBRA

5812 5861 5878 5756 5728 5791 5605 5595  
5597

LYNX

2415 2493 2500 2541

MONOCEROS

2170 2182 2252 2236 2254 2261 2245 2259  
2269 2302 2309 2316 2346

ORION

1762 1662 1663 1977 1990 2023 2071 2112

PEGASUS

7156 7042 7177 7465 7463 7332 7457 7619  
7626 7623 7742 7814 23

PERSEUS

1058 1003 1207 1175 1193 1161 1169 1348  
1491 1579 1582 1605 1624

PISCES

7541 7562 7785 7832 125 198 315 410  
499 514 660 665 706 741 718

PUPPIS

2396 2414 2432 2467 2525

SAGITTARIUS

6507 6526 6596 6717

SCULPTOR

7507 24

SERPENS

5970 6070 6604

SEXTANS

3156

TAURUS

1514 1750 1587

TRIANGULUM

672 604 890 925 1060

URSA MAJOR

2639 2756 2880 2805 3065 3516 3073 3225  
3359 3668 3622 3642 3669 3683 3756 3319  
3583 4271 4290 4605 4096 4144 4047 4100  
4157 4013 3652 4062 5447 5462 5485 5443  
5585 5204 5308 5430 5481 5480 5448

VIRGO

4045 4073 4168 4267 4299 4294 4313 4124  
4233 4224 4235 4241 4260 4264 4270 4339  
4343 4608 4647 4639 4519 4612 4586 4880  
5020 5129 4691 4904 4999 4487 4941 4915  
4981 4928 4939 4742 5077 4984 4902 5044  
5037 5018 5084 5068 5087 5134 5493 5426  
5506 5507 5560 5638 5668 5750 5775 5806  
5813 5831 5838 5850 5854 5864

VULPECULA

6793 6800

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## Extreme Lunar Crescent Data [L1099-1104]

Stephen Saber

### Young/Old Crescent Spotting Tips

Set up at a site with as much altitude as possible overlooking an unobstructed horizon.

Optimal sky transparency allows the crescent to be detected and tracked down to, or up from, the horizon.

Using a telescope or binoculars (mounted binos are recommended), fine tune the focus on Venus, Jupiter, or one of the brighter stars beforehand.

For dusk attempts, have Sol's setting azimuth on hand- making note after sunset of a random landmark at that position for reference- as well as Luna's altaz position at sunset thru moonset. Accordingly, for dawn attempts, have Luna's altaz info for moonrise thru sunrise.

As dawn slivers have the advantage of possible detection with dark-adapted eyes, wearing sunglasses during the day prior to sunset attempts is recommended for maximum 'dusk' adaptation.

Once the crescent is acquired in binoculars, walk the bino down to the horizon/random landmark in consecutive FOVs for the approximate naked-eye altaz.

A favorable elongation is important. In the 24 hours before or after New Moon, Luna's angular separation from Sol can vary by several degrees. With a favorable ecliptic, net elongations (as altitude) of  $6^\circ$  or more at sunset or moonrise offer the best window for detection.  $10-12^\circ$  is necessary to catch Saber's beads in optimal/deep twilight. Observers nearer to the equator than the poles enjoy a much greater frequency of steep ecliptics.

Illuminated fractions of same-age crescents within 24 hours of New Moon can vary by over 200% and more than a full magnitude of brightness. Slivers near perigee provide faster elongations and thicker, brighter lunar profiles for personal record crescent spotting.

Last but not least, don't always count-out a shallow ecliptic. Occasionally our moon's extreme northern or southern declination will compensate for a less than favorable ecliptic angle.

### Lunation 1099

#### New Moon 26 October 2011 1957ut

*Areas offering net elongations as altitude of  $6^\circ$  or more at sunrise and sunset are indicated in blue/orange above with corresponding crescent data provided below.*

#### Angular Size/Distance

@-30hours 33.6'/355444km

@ 00hours 33.7'/354967km

@+30hours 33.0'/361990km

#### Declination

@-30hours  $-10^\circ 26'$

@ 00hours  $-16^\circ 36'$

@+30hours  $-20^\circ 46'$

#### Colongitude

@-30h  $253.4^\circ$

@ 00h  $268.5^\circ$

@+30h  $283.8^\circ$

#### Illumination/Mag

@-30hours 0.025%/-2.72

@+30hours 0.023%/-2.38

**-30h Waning** age/moonrise/az

60n160w -27:29/1628ut/110  
20n160w -28:29/1528ut/100

50n120e -22:14/2143ut/108  
50n150e -24:21/1936ut/107

30n30e -16:27/0330ut/104  
30n60e -18:33/0124ut/104  
30n90e -20:38/2319ut/103  
30n120e -22:44/2113ut/103

10n00e -14:43/0514ut/103  
10n30e -16:48/0309ut/102  
10n90e -20:58/2259ut/102  
10n120e -23:03/2054ut/101

10s30e -17:07/0250ut/102  
10s120e -23:20/2037ut/101  
10s150e -25:24/1833ut/100

30s30e -17:28/0229ut/104  
30s120e -23:39/2018ut/103  
30s150e -25:42/1815ut/102

### **-30h Waxing age/sunset/altaz**

30n120w 29:21/0118ut/7.3,241  
30n90w 27:21/2318ut/6.4,241

10n90w 27:42/2339ut/11.1,247  
10n60w 25:42/2139ut/10.0,247  
10n00e 21:42/1739ut/7.6,248  
10n30e 19:42/1539ut/6.6,249

10s60w 26:00/2157ut/12.6,252  
10s30e 20:00/1557ut/9.3,252

30s60w 26:22/2219ut/13.5,255  
30s30e 20:22/1619ut/10.2,254  
30s120e 14:22/1019ut/6.6,253

### **Lunation 1100**

#### **New Moon 25 November 2011 0610ut**

*Areas offering net elongations as altitude of 6° or more  
at sunrise and sunset are indicated in blue/orange above  
with corresponding crescent data provided below.*

#### **Angular Size/Distance**

@-30hours 33.0'/362684km

@ 00hours 32.6'/366609km

@+30hours 32.5'/367810km

## Declination

@-30hours -19°05'

@ 00hours -22°04'

@+30hours -23°03'

## Colongitude

@-30h 251.7°

@ 00h 266.9°

@+30h 282.3°

## Libration (long°) 90w,00e,90e

@-30h -0.2,+1.0,+1.6

@ 00h +2.9,+3.9,+2.9

@+30h +5.8,+5.1,+3.8

## Illumination/Mag

@-30hours 0.023%/-2.72

@+30hours 0.022%/-2.38

## **-30h Waning** age/moonrise/az

50n00e -23:44/0626ut/121

50n90e -30:04/0006ut/119

30n120w -16:15/1355ut/113

30n75e -29:53/0017ut/111

10n90w -18:56/1114ut/110

10n75e -30:26/2344ut/108

10s90w -19:27/1043ut/110

10s60e -29:51/0019ut/109

30s90w -20:02/1008ut/113

30s45e -29:21/0049ut/111

## **-30h Waxing** age/sunset/altaz

20n160w 21:50/0400ut/8.5,241

30n120w 18:51/0101ut/6.1,239

30n75e 29:51/1201ut/11.0,235

30n135e 25:51/0801ut/9.2,236

10n90w 17:26/2336ut/7.3,245

10n60w 15:26/2136ut/6.2,245

10n75e 30:26/1236ut/14.3,243

10n120e 27:26/0936ut/12.5,243

10s90w 17:57/0007ut/8.2,248

10s30w 13:57/2007ut/6.1,248

10s90e 29:57/1207ut/15.1,249  
10s150e 25:57/0807ut/12.6,249

30s90w 18:33/0043ut/7.6,249  
30s30w 14:33/2043ut/6.0,248

30s105e 29:33/1143ut/13.3,252  
30s150e 26:33/0843ut/12.0,251

### **Lunation 1101**

#### **New Moon 24 December 2011 1808ut**

*Areas offering net elongations as altitude of 6° or more  
at sunrise and sunset are indicated in blue/orange above  
with corresponding crescent data provided below.*

#### Angular Size/Distance

@-30hours 32.6'/366420km  
@ 00hours 32.5'/367089km  
@+30hours 31.9'/374858km

#### Declination

@-30hours -23°13'  
@ 00hours -22°39'  
@+30hours -19°32'

#### Colongitude

@-30h 250.7°  
@ 00h 266.0°  
@+30h 281.3°

#### Libration (long°) 90w,00e,90e

@-30h +3.6,+2.4,+1.7  
@ 00h +4.1,+3.1,+4.1  
@+30h +4.3,+5.0,+6.2

#### Illumination/Mag

@-30hours 0.021%/-2.38  
@+30hours 0.020%/-2.38

#### **-30h Waning** age/moonrise/az

20n160w -25:57/1611ut/114

50n120w -27:16/1452ut/126  
50n90w -29:22/1246ut/126  
50n75w -30:24/1144ut/126

30n120w -28:22/1346ut/116  
30n90w -30:27/1141ut/116

10n45e -14:56/0312ut/114  
10n150e -22:47/1921ut/113



10s45e -15:31/0237ut/111  
10s150e -23:22/1846ut/113

30s75e -18:50/2318ut/116  
30s150e -24:03/1805ut/116

**-30h Waxing** age/sunset/altaz

50n105w 28:56/2304ut/9.5,222  
50n45e 18:56/1304ut/6.2,226

30n105w 30:00/0008ut/13.4,237  
30n120e 14:59/0907ut/6.3,231

10n90w 29:39/2347ut/14.3,290  
10n135e 14:39/0847/6.3,247

10s90w 30:14/0022ut/13.3,253  
10s120e 17:14/1022ut/6.1,250

30s75w 29:55/0003ut/9.4,254  
30s45e 21:55/1603ut/6.2,251

**Lunation 1102**

**New Moon 23 January 2012 0740ut**

*Areas offering net elongations as altitude of 6° or more  
at sunrise and sunset are indicated in blue/orange above  
with corresponding crescent data provided below.*

Angular Size/Distance

@-30hours 31.5'/379849km  
@ 00hours 31.0'/385216km  
@+30hours 30.9'/385841km

Declination

@-30hours -20°15'  
@ 00hours -16°11'  
@+30hours -11°11'

Colongitude

@-30hours 250.3°  
@ 00hours 265.5°  
@+30hours 280.7°

Libration (long°) 90w,00e,90e

@-30h +3.3,+4.7,+4.8  
@ 00h +5.1,+5.5,+4.2  
@+30h +5.8,+4.7,+4.0

Illumination/Mag

@-30hours 0.019%/-2.04  
@+30hours 0.018%/-2.04

**-30h Waning** age/moonrise/az

20n160w -14:57/1643ut/109

50n30e -26:51/0449ut/121

50n45e -27:52/0348ut/121

50n75e -29:55/0145ut/121

30n120w -17:25/1415ut/111

30n60e -29:49/0151ut/113

10n90w -20:21/1139ut/109

10n45e -29:21/0219ut/110

10s90w -20:30/1110ut/109

10s45e -29:51/0149ut/110

30s90w -21:02/1038ut/111

30s30e -29:24/0216ut/113

### **-30h Waxing** age/sunset/altaz

60n160w 18:52/0232ut/7.4,225

20n160w 20:47/0427ut/9.2,253

50n120w 17:00/0040ut/7.4,238

50n60w 13:00/2040ut/6.0,239

50n45e 30:01/1341ut/12.6,234

50n150e 23:00/0640ut/10.1,236

30n120w 17:50/0130ut/8.2,249

30n60w 13:50/2130ut/6.2,250

30n60e 29:50/1330ut/14.1,248

30n150e 23:50/0730ut/11.2,248

10n90w 16:22/0002ut/6.2,255

10n75e 29:22/1302ut/12.6,256

10n150e 24:22/0802ut/10.2,256

10s75e 29:50/1330ut/10.1,261

10s150e 24:50/0830ut/7.6,259

### **Lunation 1103**

#### **New Moon 21 February 2012 2235ut**

*Areas offering net elongations as altitude of 6° or more at sunrise and sunset are indicated in blue/orange above with corresponding crescent data provided below.*

#### **Angular Size/Distance**

@-30hours 30.9'/387246km

@ 00hours 30.5'/391610km

@+30hours 30.2'/395941km

## Declination

@-30hours -11°33'

@ 00hours -05°48'

@+30hours +00°01'

## Colongitude

@-30hours 250.4°

@ 00hours 265.6°

@+30hours 280.7°

## Libration (long°) 90w,00e,90e

@-30h +4.8,+3.8,+4.6

@ 00h +3.6,+4.1,+5.2

@+30h +3.3,+4.5,+4.3

## Illumination/Mag

@-30hours 0.017%/-1.70

@+30hours 0.016%/-1.70

## **-30hr waning** age/moonrise/az/win

20n160w -30:29/1606ut/102/01:00

50n90e -22:21/0014ut/106/00:46

50n150e -26:25/2010ut/107/00:50

30n00e -16:38/0557ut/100/00:37

30n135e -25:52/2043ut/102/00:52

10n15w -15:52/0643ut/99/00:34

10n120e -25:08/2127ut/101/00:50

10s15e -16:05/0630ut/99/00:32

10s150e -27:28/1907ut/101/00:55

30s15e -18:25/0410ut/101/00:34

30s150e -27:47/1848ut/103/00:55

## **-30hr waxing** age/sunset/altaz/win

60n160w 29:15/0350ut/12.1,246/01:54

20n160w 30:08/0443ut/12.3,265/01:00

50n120w 26:56/0121ut/11.5,253/01:24

50n90e 12:55/1130ut/6.0,256/00:46

30n120w 27:20/0155ut/11.5,262/01:02

30n60e 15:19/1354ut/6.2,262/00:35

10n90w 25:35/0010ut/9.2,267/00:43

10n15e 18:35/1710ut/6.0,266/00:29

## **Lunation 1104**

**New Moon 22 March 2012 1436ut**

*Areas offering net elongations as altitude of 6° or more at sunrise and sunset are indicated in blue/orange above with corresponding crescent data provided below.*

Angular Size/Distance

@-30hours 30.1'/397465km  
@ 00hours 29.8'/400793km  
@+30hours 29.6'/403450km

Declination

@-30hours -00°33'  
@ 00hours +05°05'  
@+30hours +10°17'

Colongitude

@-30hours 251.3°  
@ 00hours 266.5°  
@+30hours 281.8°

Libration (long°) 90w,00e,90e

@-30h +5.0,+4.8,+3.6  
@ 00h +3.9,+2.7,+2.6  
@+30h +1.6,+1.1,+2.2

Illumination/Mag

@-30hours 0.016%/-1.36  
@+30hours 0.014%/-1.36

**-30hr waning** age/moonrise/az/win

20n160w -22:37/1559ut/89/00:43

50n120w -25:23/1313ut/89/00:45  
50n60w -28:37/0959ut/99/00:49

30n120w -25:22/1314ut/89/00:47  
30n90w -28:24/1112ut/90/00:49

30n105e -16:10/2226ut/87/00:35  
30n135e -19:14/1922ut/88/00:39

10n90w -28:24/1112ut/90/00:51  
10n60w -30:28/0908ut/90/00:55

10n75e -14:03/0033ut/87/00:29  
10n120e -17:08/2128ut/88/00:34

10s75w -28:26/1010ut/90/00:53  
10s45w -30:30/0806ut/90/00:57

10s120e -17:05/2131ut/88/00:32  
10s150e -19:09/1927ut/88/00:36

30s75w -28:27/1009ut/90/00:55  
30s60w -29:29/0907ut/90/00:57

30s150e -19:07/1929ut/88/00:35

50s75w -28:28/1008ut/90/00:55

**-30hr waxing** age/sunset/altaz/win

60n160w 14:27/0503ut/6.0,273/01:00

50n00e 27:31/1819ut/11.2,271/01:21

50n135e 18:43/0919ut/7.4,273/00:57

30n00e 27:38/1814ut/11.1,274/00:59

30n135e 18:38/0914ut/7.1,275/00:39

10n15w 28:35/1911ut/10.1,278/00:47

10n120e 19:35/1011ut/6.0,277/00:30

10s45w 30:33/2109ut/7.5,282/00:37

10s30e 25:33/1609ut/5.9,281/00:29

*raw data generated with WinEphem*

*\*check local listings\**

For more recent maps visit <http://lunarcrescentvisibility.blogspot.com/>

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### **Lunar Phenomena: Saber's Beads**

*You've probably seen a very thin sliver of our moon after sunset or before sunrise. Imagine it thinner. And even thinner. Eventually all that's left is sunlight shining off the mountain peaks while leaving the valleys in darkness. This arched 'string-of-pearls' is known as Saber's beads after a comment I made about the visual similarity to what is seen during a solar eclipse.*

*Just before (and after) the moon passes in front of the sun, light shines at us through the valleys but is blocked by the mountains- the mirrored effect of Saber's beads. After reporting this resemblance, my esteemed stargazing colleagues honored me with its namesake.*

*While promoted as an outreach term, further scientific study may also provide new insights regarding local albedo values within the lunar libration zones.*

\*\*\*\*\*

### **EXTREME CRESCENT SPOTTING TIPS**

Set up at a site with as much altitude as possible overlooking an unobstructed horizon.

Optimal sky transparency allows the crescent to be detected and tracked down to, or up from, the horizon.

Using a telescope or binoculars (mounted binos are recommended), fine tune the focus on Venus, Jupiter, or one of the brighter stars beforehand.

For dusk attempts, have Sol's setting azimuth on hand- making note after sunset of a random landmark at that position for reference- as well as Luna's altaz position at sunset thru moonset. Accordingly, for dawn attempts, have Luna's altaz info for moonrise thru sunrise.

As dawn slivers have the advantage of possible detection with dark-adapted eyes, wearing sunglasses during the day prior to sunset attempts is recommended for maximum 'dusk' adaptation.

Once the crescent is acquired in binoculars, walk the bino down to the horizon/random landmark in consecutive FOVs for the approximate naked-eye altaz.

A favorable elongation is important. In the 24 hours before or after New Moon, Luna's angular separation from Sol can vary by several degrees. With a favorable ecliptic, net elongations (as altitude) of  $6^\circ$  or more at sunset or moonrise offer the best window for detection.  $10-12^\circ$  is necessary to catch Saber's beads in optimal/deep twilight. Observers nearer to the equator than the poles enjoy a much greater frequency of steep ecliptics. Illuminated fractions of same-age crescents within 24 hours of New Moon can vary by 200% and a full magnitude of brightness. Slivers near perigee help present a thicker and brighter lunar profile for personal record crescent spotting.

Last but not least, don't always count-out a shallow ecliptic. Occasionally our moon's extreme northern or southern declination will compensate for a less than favorable ecliptic angle.

## BRACKETING THE SLIVERS

Another rare and challenging notch for ones lunar bedpost is to catch the consecutive waning and waxing crescents within 24 hours on each side of New Moon.

For example, July 2008's Buck Moon offered such an opportunity as I was able to spot both the -16.5 hour illumination before sunrise on the 2nd and the +23.5 hour sliver just after sunset on the 3rd.

Clean horizons for both windows is a gift in itself.

\*\*\*\*\*

## EXTREME CRESCENTS AND COLONGITUDE

A big piece of the puzzle concerning the appearance of a thin crescent's degree of segmentation may be predicted by its colongitude at New Moon which, not suprisingly, can vary by more than  $10^\circ$ , trumping the effects and cycling independently of the apogee-perigee lunar profiles. VMA simulations show New Moon colongs less than  $270^\circ$  to favor segmented waxing crescents while those over  $270^\circ$  favor segmented waning crescents. (Those over  $270^\circ$  would be considered 'early' *colongitudinal* moons).

Equally important to those hunting Saber's beads, colongitude may also be used inversely to determine the best profiles and visibilities for personal record crescent spotting.

The table below shows the lunation, colongitude at New Moon, duration in hours of the most segmented waxing limb ( $-280^\circ$  colongitude), and the duration in hours of the most segmented waning/preceding limb ( $+260^\circ$  colongitude). Data derived from thin crescent images and my own experiences with extreme crescents also concur with a  $260-280^\circ$  colong window. Of note; the two youngest naked-eye crescent sighting to date (May 1990/aged 15.5 hrs and Jan 2014/13h25m), my May '06 sighting (20.5 hrs), and the Lodriguss example above (27.5 hrs) all have a colongitude of  $276-278^\circ$ .

Thickness and exact formations involved vary at each lunation due to libration and other factors. Illuminations caused by sunlit mountainous regions and/or albedo effects also bear further study.

lun/colong/h-280/h+260

1068	274.7	10	28
1069	273.0	13	25
1070	271.1	17	21
1071	269.3	20	18
1072	267.6	24	14
1073	266.0	27	11
1074	264.9	29	09
1075	264.7	29	09
1076	266.0	27	11
1077	268.5	22	16
1078	271.3	16	22

1079 273.5 12 26  
1080 274.7 10 28  
1081 274.9 09 29  
1082 274.4 10 28  
1083 273.3 12 26  
1084 271.5 16 22  
1085 269.3 21 17  
1086 267.0 25 13  
1087 265.3 28 10  
1088 264.7 29 09  
1089 265.3 28 09  
1090 266.9 25 13  
1091 268.9 21 17  
1092 271.1 17 21  
1093 273.1 13 25  
1094 274.7 10 28

#### EXTREME CRESCENTS AND LIBRATION

To this we can now take our static moon and add or subtract visible illuminated surface for positive or negative longitudinal libration (libration in latitude mostly affects the clockwise/counter-clockwise orientation).

lun/colong(net)/h-280(net)/h+260(net)

1068 274.7(270.7) 10(19) 28(20)  
1069 273.0(270.0) 13(16) 25(16)

Constant moderate negative longitudinal libration for these durations.

The waxing crescent now takes longer to reach the same visible illumination, while the waning crescent takes longer to reach the arbitrary segmented zone.

A negative libration (west) not only favors thicker extreme waning crescents, but could potentially render otherwise 'easy' first crescents undetectable.

1070 271.1(268.9) 16(16) 21(17)

Zero long-lib takes place near +16 hrs with only a slight impact on the waning crescent.

1071 269.3(270.6) 20(18) 18(18)

Zero long-lib takes place near -20 hrs with only a slight impact on the waxing crescent.

If this still seems too easy you would be correct, as libration is further dependent on observer location (the above examples use results from 00n00e).

A testament to each lunar aspect being unique, finding exact duplicate libration/colong syncopations are at best wildly algorithmic, and on the verge of serendipitous.

\*\*\*\*\*

For the record, here's the crescent data from my first observation of Saber's beads:

New Moon 27 May 2006 0526ut

(+24hours)

Angular Size/Distance 31.2'/383356km

Declination +27°04'

Colongitude 277.6°

Solar Elongation 13.5°

Illumination/Mag 0.012%/-1.02

41.5n 90.5w

moonset window: **01h10m**

sunset/azimuth: 0126ut/300°

altaz at sunset: **10.3°/298°**

moonset/azimuth: 0236ut/308°

age at sunset: **20h00m**

First detected at +20.2 hours, this instance of Saber's beads peaked in deep twilight with the infant crescent hanging 2.0° above the horizon at a solar elongation of 12.2°.

*By this time I was fully immersed in the imagery of a total solar eclipse- as if in the next few moments I would either be basking in our sun's corona or forced to turn away from its glare. Low altitude scintillation added a surreal dynamic to the event.*

*This experience left me with the mystery of why the phenomenon had escaped my attention in then over 10 years of dedicated young/old crescent spotting, and more so, gone unreported after four centuries of magnified scrutiny. At the same time, this would also mark the relation of stray tip beads within and near libration zones on thicker crescents as potential precursors to the complete effect.*

*As a drummer and not a scientist, I've done my best to make some headway into the window parameters for viewing this rare and beautiful lunar aspect.*

Note the extreme northern declination and sunset altitude combined with a favorable colongitude and ecliptic which allowed one of the longest moonset windows and highest altitudes at sunset possible for a crescent that age. It is this rarity of catching the fully/near-fully segmented limb in a dark sky that defines the complete phenomenon.

\*\*\*\*\*

### Saber's Beads In Non-Astronomy Fiction

*[excerpt from Cailyn Vature's 'Raven' (2010)]*

It was cold outside and I could see my breath rising into the air. The stars were out in force shining their bright kaleidoscope; they seemed brighter than usual because the moon was just a sliver crescent in the night sky. I gazed up at them just as I had countless times before.

Many a time I had come out with a blanket just like I had tonight and gazed up at them, and thought 'what a lonely world we must be...' but tonight it was different and they shined for me and I sat admiring their beauty.

"They really are something aren't they?"

I looked to my right and gazed at Jay who was leaning against my rock with me. His eyes dazzled with the sparkles of a million stars behind them making them shimmer in the darkness. My arms were wrapped around him keeping them warm against the cool night air.

"I always come out and watch the stars" I answered.



“They are something” Jay said giving out a sigh of contentment.  
“They’re so bright tonight” I commented.  
“You see the moon?” Jay asked  
“Yeah it’s just a tiny crescent” I said  
“You know what’s that’s called?” he asked, turning his head to face me and giving a soft smile.  
“A crescent moon?” I asked  
“The moon is just moments away from becoming a new moon which it will be for only a few moments until it is a crescent again- that crescent where the moon is nothing but a broken line. Those beads of broken light, they are called Saber’s beads.”  
“I didn’t know that” I said looking up at the moon.  
“There is a very old story that talks about the Saber’s beads” Jay said giving me a smile, and I nodded for him to continue.  
“A long time ago man lived peacefully, there was no hate, no lies, and it was a time when everyone was a brother. Then one day a great king from a distant land came and said ‘I am greatest of thee, all that ye own shall belong to me.’ The great king took land, food, and even the lives of his people, and soon death flowed so greatly that heaven itself burst open.”  
“What happened?” I asked.  
“God himself came and struck down the king casting him forever from the land but peace has never returned and heaven will forever be too full. So the legends say on the night of the new moon with the last fading light souls trapped on earth may go to heaven, and souls in heaven wanting to return to earth may come back with the first light after the new moon”.  
As if God had heard the story I watched with amazement as the light from the moon faded to total darkness and then the first lights from the waxing moon appeared.  
“They have returned” Jay said watching the light.  
I felt a cold shiver run down my spine as if the story had real meaning and it touched me deep inside.

Saber’s Beads In Music

<http://www.youtube.com/watch?v=C18Dp7Lw4HA>  
*Sophie Hutchings (2012)*

*[Composer/pianist*

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## **Binocular Stargazing** **Stephen Saber**

Stargazing can be enjoyed using any binocular.

It can be enjoyed even more with binoculars when fully dark-adapted and viewing from a moonless site far from any city lights.

The following is a collection of my thoughts on choosing and using binoculars for stargazing, some reviews, and 150 doublestars to enjoy. A wealth of deepsky targets suitable for binos can be found in the Astronomical League Observe Program lists.

First, an important warning:

DO NOT EVER LOOK DIRECTLY AT THE SUN, EITHER WITH YOUR UNAIDED EYE OR THROUGH A TELESCOPE OR BINOCULARS, UNTIL YOU ARE THOROUGHLY FAMILIAR WITH THE SAFE METHODS OF OBSERVING THE SUN. DO NOT EVER LEAVE A TELESCOPE OR BINOCULAR UNATTENDED SO THAT A CHILD COULD POINT IT AT THE SUN. PERMANENT EYE DAMAGE OR BLINDNESS COULD RESULT.

\*\*\*\*\*

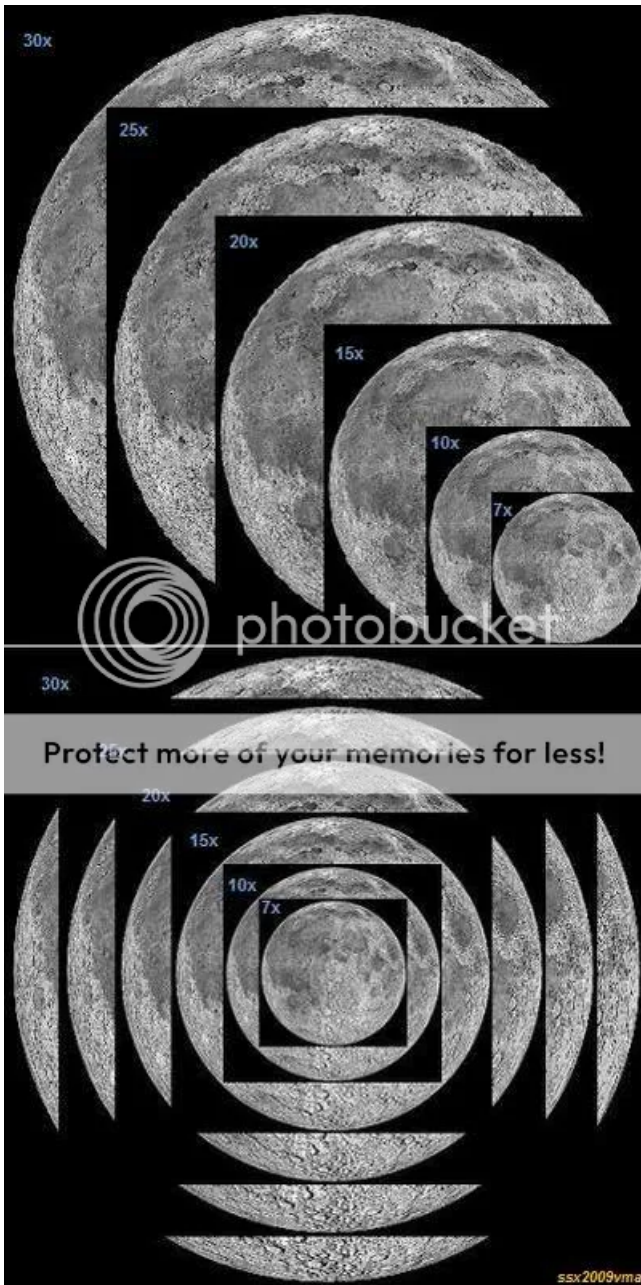
Among other factors, choosing binoculars is about trade offs between magnification, aperture, weight, field of view, eye relief, coatings,

and price.

Personal preferences are as individual as our eyesight. Go with the binos that satisfy the most important of your own preferences in these areas.

Choosing a size is literally a matter of desired perspective. Various powers and fields shed new light and aesthetics to our celestial treasures. Different instruments for different moods.

Several years ago I had the opportunity to view the night sky thru 2.5x opera glasses. IIRC, the FOV was 20-25°. Felt more like bionic-vision than bino-vision. Quite an interesting experience. Saturn and the lunar detail seen at 30x is always equally as compelling.



10x50s are a recommended first binocular for stargazing. It is the highest magnification that most can hold relatively steady without a tripod while still providing a comfortably large field of view and exit pupil. If buying for a child I would suggest a smaller, lighter 7×35 or 8×40.

I've had a good track record and would recommend ordering from major online dealers such as Orion, Garrett, and Oberwerks, but buying locally or driving to avoid shipping mishaps is always preferable. Good communication and a solid return policy are marks of a reputable online dealer. Outdoors and hunting supply stores have been known to carry a decent variety of quality instruments. As with scopes, starparties are also a great place to try out and ask about a variety of binoculars. The local astroclub may even have some renters to audition.

#### SPEAKING OF AUDITIONING BINOCULARS:

##### SHAKE IT

Make sure nothing is loose or bouncing around inside.

##### LOOK AT IT

Make sure there are no scratches or cracks on the glass or body.

At arm's length, look for round, unobstructed circles of light thru the barrels and eyepieces.

Quality BAK4 glass is recommended.  
Is there a center-focus adjustment?  
Are they tripod-adaptable if needed?

#### MESS WITH IT

Make sure the caps are tight. Make sure the main hinge, focuser, and other adjustments all move smoothly, securely, and with no play.

#### NOW, LOOK THRU IT

If there's a right diopter dial, close your right eye. Use the center-focus dial for your left eye. Now close your left eye. Use the diopter to focus the right eye.

Can you move the hinge to create a nice, circular image?

Can you see the entire field comfortably?

Does the image bulge-out or bend-in excessively at the edges? A flat, focused image across most of the field is best.

Is there excessive false color in the field of view.

For handheld use, will you be able to hold the image fairly steady for minutes at a time?

Are the barrels properly aligned? Slowly alternate closing and opening each eye. The image should merge smoothly.

#### ASK ABOUT IT

Make sure there is a satisfactory guarantee and return policy.

Any binocular that passes these tests to your approval should provide an enjoyable ride under the stars.

\*\*\*\*\*

#### CONGRATS ON THE NEW GLASS

*Okay, Saber. I'm dark-adapted in the middle of a moonless cornfield away from city lights with my new 10×50. Now what?*

Fortunately you read this ahead of time and brought a red flashlight, S&T's Pocket Sky Atlas or a planisphere, Harrington's *Touring the Universe through Binoculars* or printouts from the AL bino target lists linked above, a blanket or recliner, bug spray or extra clothes, and maybe a sketchpad and pen.

Or forget all that and just randomly cruise the night sky at your leisure.

There is no wrong way to enjoy the stars.

Note: It's always a good idea to bring *something* else along that's unique to stargazing.

I once had a lengthy encounter (more lengthy than usual anyway) with the Illinois State Police while getting 'back to basics' in the boonies armed with only an 8×40. On this occasion, without even a star atlas or red flashlight to lend credibility, they had a very hard time believing I was simply stargazing. That I look more like a convict than a cosmologist didn't help matters.

But they eventually decided there were no houses close enough for me to be planning any pillaging or plundering, and left me to my claimed business with the stars.

\*\*\*\*\*

#### BEFORE WE GO ON

Receiving any collimated, mechanically-sound binocular with sufficient eye relief/ipd/diopter adjustment while showing minimal false color and pinpoint stars across 75% of the field rates as a very good purchase.

There's no shame in returning an instrument that doesn't meet these basic requirements.

Even though some companies inspect and pack their products better than others, we always roll the dice when mail ordering precision optics. Fortunately the odds are on our side. Of my 25+ online bino purchases only 2

have been untweakable returns.

I should also mention that the world of binoculars, in actual use, is far from an exact science. Specification and mechanical variances are common, even among the same models. Bino experiences and assessments also vary with the individual and visual acuity. In short, try not to let the quest for a perfect binocular take precedence over your enjoyment of the night sky.

Keep this in mind as we dig a little deeper.

\*\*\*\*\*

## MAGNIFICATION/SIZE/FIELD

With binoculars, magnification has a much higher performance emphasis than aperture. The preferred AVI (Adler Visibility Index:  $\text{Mag} \times \text{Sq. Root of Aperture}$ ) yields the following values:

7×35 40  
8×40 50  
7×50 50  
10×50 70  
10×70 85  
12×50 85  
15×70 125  
15×80 135  
20×70 165  
20×80 180  
25×80 225  
25×100 250  
30×80 270  
30×100 300

From this basic list of sizes we see that while a darker sky can easily compensate for 10-20mm of aperture, it barely competes with an instrument offering a 5x larger image scale.

More magnification = More stars, less field, less steady for handheld use.

Less magnification = Fewer stars, more field, more steady for handheld use.

Darker sky = Many more stars. This is also important to remember as we cannot take advantage of any binocular's full aperture until our pupils dark adapt and open to at least match the bino's exit pupil (aperture/mag).

\*\*\*\*\*

## BANGIN OFF A THE BRICKS

A brick wall can tell us alot about our binoculars.

Preferably mounted and from at least the minimum focus distance, a bino's magnification and degree of major aberrations can all be quickly field tested against this common building pattern.

### Magnification

To estimate an instrument's actual magnification, look through the left ocular with your right eye (or vice versa) while keeping both eyes open. The magnified view will be superimposed with the unaided view. Count the number of 1x bricks that traverse a single magnified brick. +/-0.5- 1.0x variances are not uncommon.

### Aberrations

*Spherical*: Softness over entire field. None of the image will not come to a crisp focus.

*Astigmatism*: Horizontal lines will appear in focus and vertical lines out of focus, or vice versa.

*Curvature*: Periphery of field will appear in focus and center of field out of focus, or vice versa.

*Coma*: More noticeable under the stars, the images show comet-like extensions increasing toward the periphery.

*Distortion*: Straight lines bend in toward the center of the image (positive/pincushion) or away from the center of the image (negative/barrel).

Note: Minimal positive distortion at the edges is a good thing, and usually intentionally introduced. It helps sharpen up the inner field.

*Chromatic*: Images are blurred with false color at the fringes. In general, the higher the magnification, the more noticeable the chromatic aberration.

Any excessive daytime aberration will also take its toll on the even more stringent proving grounds of the night sky.

\*\*\*\*\*

Eye relief and comfort at the eyepieces have always been the first dealmaker/breaker considerations with all of my bino purchases.

I've auditioned several binos that, while wonderful in all other aspects, only offer an inaccessible 6-9mms of ER.

Extraneous eye relief, OTOH, is a comparatively much easier issue to deal with. While eye placement can be more critical, extending the eyeguards or cups is usually all that is required.

Most would agree that extra ER is preferable to not having enough.

Without eyeglasses a minimum useable eye relief (ER minus lens recess) of 10mm is recommended. Those who wear glasses often require at least 16mm to take in the entire field. There are a few more caring dealers that go so far as to relate the actual useable eye relief.

Otherwise, the following rules of thumb tend to apply:

No ER spec mentioned: Embarrassingly and/or painfully short.

ER mentioned: Subtract 2-6mm for recess.

'Long eye relief' mentioned but not qualified: Roll the dice.

\*\*\*\*\*

Few binoculars are completely unaffected by false color on Luna and the brighter celestial targets. Outside of using expensive apo glass, chromatic aberration in binoculars tends to come with the fast f/r territory. Increased magnification generally amplifies any apparent CA.

Full multi-coatings (FMC) decrease internal reflections and increase night sky contrast. IME, this contrast also increases the appearance of CA on the bright stuff. Standard fully-coated (FC) binos often show less false color at the expense of increased internal reflections.

As there are maybe a handful of celestial sources out of billions that might create offensive CA, most will opt for the reduced reflections and better contrast provided with FMC or MC (multi-coated) models.

\*\*\*\*\*

While a binocular's exit pupil is not unimportant, it is often overrated. Darker skies, higher magnification, and superior AR coatings can all more than compensate for any loss of image brightness due to a smaller exit pupil. Larger exit pupils often have the advantage of more forgiving eye placement, but sufficient eye relief again

plays an important role in the amount of vignette and attaining optimal eye position. Smaller ExPs also stop down eye pupil aberrations which commonly increase toward the periphery.

## City vs Rural

Binos gulp in lots of skyglow along with the stars from the city which wreaks havoc on our pupils' dilation and dark adaptation. Smaller exit pupils will stop down the magnified peripheral skyglow which at least gives our cones a better signal to noise ratio for detecting detail, but any build up of rhodopsin is still largely inhibited. After scanning the bright city skies most have lowered their binocular to find a naked eye circular field of bleached rhodopsin waiting for them (or in one eye after viewing at the scope). Closing our eyes to get a semblance of decent DA back is futile as any rhodopsin build up will scatter soon after we raise the bino to start another round. That we're not also fighting our own physiology is why dark skies provide us with a dramatic increase in detection above what might be academically expected.

3-5mm exit pupils are fine from any LVM. Try 5mms and up from very dark sites for better performance. Even if the nok's ExP exceeds our own under rural skies, the unused incoming light is at least not detrimental- and even allows more room to maneuver behind the eyepieces.

\*\*\*\*\*

One should expect a mechanically sound and collimated mail order binocular whether they've paid 500 dollars or 50 dollars.

Unless you're an accomplished tinkerer, attempting a DIY prism alignment via the tiny adjustment screws also runs the risk of voiding any warranty by accidentally scratching or otherwise damaging the instrument. There's also the possibility that the prisms are fine, but the barrels are poorly aligned.

Mail order and precision optics will never mix, but my advice is to return the binocular when possible and ask for overnight shipping on a properly inspected model.

\*\*\*\*\*

I'm not a big tripod fan, but it is a necessary evil for getting the steadiest views and detail from any binocular. Mounted bins also allow increased resolution and detection of targets as much as 2 magnitudes fainter than those seen in freehand views.

For handheld use one can create a human tripod by resting both elbows on a support (car, railing, etc.). Some find more braced stability when using heavier instruments. Observing prone or in a recliner is often recommended. Holding big bins closer to the objectives can also provide more comfortable ergonomics.

\*\*\*\*\*

## *why binoculars...*

It's the grab n' go freedom and wide fields.

It's the increase in depth perception and signal strength (on-axis and peripheral).

It's the effortless navigation, straight thru viewing, and more natural extension of our own eyes.

My first serious glass was a giant binocular.

One would still be hard pressed to find me basking under the stars without 80mm guns at my side.

## *what am I getting into with larger/hi-mag binoculars?*

You're getting into more weight/tripod use, less steady freehand views, less field, and possibly more obvious CA (amplified by magnification).

Fortunately this all takes a back seat to the increase in resolution, detail, and exponential bombardment of stars.

### ***10x vs 15x...***

For stargazing purposes I'd go so far as to say 15x70s are becoming the new 10x50s- especially in light polluted skies. Certainly a popular next step up. 15x can be a shaky ride, but not beyond some measure of adaptation. The case could be made that 15s show so much more that we want/need to see it even steadier. Apparent shake at higher mags is also amplified by the smaller fov.

With practice freehanded stability with 15x70s is not beyond a good deal of improvement, but tripod-mounted (or image stabilized) noks will always offer the best views at any power.

### ***dealing with dew...***

Storing binoculars in a secure garage or vehicle has been my best dew prevention. The less change in temperature they have to endure, the better.

Or simply buy more binos. Maybe tool around with a different power/fov while the other bino defrosts.

### ***saturn thru binos...***

I've seen the ring gaps thru 10s and 15s at favorable inclinations. Not what I'd call a crisp image, though. At 25x I start looking (in vain) for Cassini's. Oohs and ahhs from the public thru 30s, plus Saturn's four brightest moons on a good night.

### ***'ruby' coatings...***

Not recommended under the stars and not to be confused with anti-reflective (AR) coatings. This gimmick reduces daytime glare by filtering the red spectrum- which only provides darker, dull images at night.

### ***nokking venus...***

Magnifications necessary to show the phases of Venus can change rapidly. While 30x will reveal the phase at most any aspect, the thin but large crescent's orientation near inferior conjunction can be detected naked eye. Glare and bad seeing are minimized by catching our sister planet at its highest elevation in the daytime sky.

### ***why dangle...***

WA (wide angle) models are always desirable, provided the extra field is free from excessive aberration and sufficient ER allows access to the full field.

### ***galaxies thru binoculars...***

Hunting most galaxies with binos is limited to being an exercise in detection and judge of sky conditions. Yet I still find the repeated mere validation of their continued presence through modest glass to be an amazing aphrodisiac.

At the other size extreme, dark site excursions through the thick arms of our Milky Way and across the Big and Little Magellanics are binocular nirvana.

### ***on zoom binos...***

Not recommended for those primarily interested viewing the night sky.

Fixed-power binoculars (up to ~20x) offer up to a 50% wider view than zoom binoculars set to the same magnification.

Decreased optical precision due to the difficulty of keeping the zoom elements of each eyepiece in perfect synchronization, and difficulty to handhold at higher magnification are other disadvantages.

### ***jove thru binos...***



I've detected the two main bands at 15x at larger oppositions.

Much more obvious at 20x.

At 25x, band asymmetries are often detected.

At 30x I have detected the SEB break occupied by the GRS (no detail).

### *if vs cf...*

Individual focus designs do not use a focuser bridge and are ideally less prone to defocus when we press against them. IFs also provide better waterproofing. A personal preference to stargazers aimed at infinity, but not a popular choice for various and repetitive distance refocusing during daytime use. A majority find center focus/diopter focusing to be adequate and most convenient.

### *binocular/bv summation...*

While no formula can cover the additional physiological gains of using both eyes, an effective aperture increase of 140% is a good place to start (e.g., 70mm noks rival 100mm scopes). Binoviewers, for all their wonder, cut the EA in half before a summation formula is applied, resulting in appreciable light loss thru apertures under 8".

### *spec vs effective aperture...*

Manufacturers love to skimp on prism size to cut production costs. This generally reduces effective apertures by 5-10% which also tweaks other specs like mag and fov. Lay your bino flat on a table or mount pointed several inches from a wall. Shine a flashlight thru an eyepiece and measure the projected circle of light to find the noks effective aperture. I've yet to meet an effective aperture that hasn't been 'rounded up' to the advertised diameter.

### *getting into the (handheld) zone...*

The best way to steadily hold your binocular is another subjective preference, and may vary by size, weight, and ergonomics of the instrument. But more important is the time and experimentation one puts into reaching their own acceptable stability. Striving for handheld stability is also excellent precision exercise for the eyes.

Getting in the 'heartbeat-limited' zone takes patience and practice, but many can eventually become capable of useable, detailed stability almost out of the gate.

Darker skies (more stars) are again recommended here for the increased reference points to accelerate coordination.

### *hi-mags for steadier views...*

Freehanding the stars with 20x (or higher) binoculars takes practice and patience to keep the views even marginally worthwhile. In the end, alot depends on how much stability we're willing to sacrifice.

The point is that we can and do get better at it as the thousands of coordinating neurons and fast twitch muscles involved adapt.

In addition, the more intense eye/brain/reflex 'training' at higher magnifications can also pay off when gearing down to freehand views at lower power (IS binos excluded).

One of many reinforcing experiences with this happened just a few nights ago. After about an hour of casually picking off Messiers with a 20x80 I went back to my vehicle to warm up and wait for the sky to turn. A Marathon-virgin 11x56 was in arm's reach and I decided to revisit my accumulated treasures with the more modest but eager glass.

Excellent wider field views aside, the relative image steadiness now rated just this side of mounted (caffeine and below zero wind chill notwithstanding). The increased handheld stability was notably more than just that which might be expected. Whether this effect is initially only perceived or enhanced by experience and adapted skill, it seems IME an exercise worthy of merit for increasing stability with more commonly handheld magnifications. (Even 15x views become easier to steady after roadtripping with 25-30x noks for awhile.)

A loose analogy to this hi-mag training might be taking practice swings on deck with a ring-weighted baseball bat.

Spend 20 minutes or so with a hi-mag nok in a/your favored braced position on a big, busy target (Luna and Pleiades work well) before dropping down in power. The actual physical/coordinative gains are cumulative, but even the expected stability difference can be enhanced out of the gate.

Another good reason to buy that first hi-mag binocular as well.

*\*as always ymmv\**

### *for those unaware...*

There's more to binocular alignment than prism

screws. The machining and matching grooves of the barrels must also be precise (and the objective itself for that matter). The angle tolerance of the barrels can be even more strict than those of the prisms.

I cite a recent example of a friend, fed up from tinkering with his bino's prism screws, who gave me his non-refundable 20×80 stating, "If you can fix em, you can have em".

The dizzying view was indeed so far out of alignment that it soon proved to be beyond the screws' adjustment capabilities.

I had another of my 80mm noks nearby and swapped barrels with the troublemaker. The image merged perfectly. Only one of the barrels was bad. The donor 80mm, however, was throwing a fit over its painful, unexpected handicap.

My solution?

Spinning both 70mm barrels from one of my more expendable 15x instruments onto the former 20x troublemaker. Again, the image merged perfectly, and I have a light-weight hybrid 20×70 for my efforts.

Of note, the three binos mentioned are all different brands yet compatible at the hip. Also, there are limits to barrel-swapping on a number of fronts

(which I plan on exploring) that in this case were not exceeded.

The moral of the story is simply that binocular misalignment is not always in the prisms. Another good justification for keeping a well-stocked arsenal of binoculars, too.

### *the c word revisited...*

If cranking the prism screws more than half a rotation either way doesn't solve an alignment problem, I'd start looking somewhere else.

Recently I found another related potential culprit in the crossbracing assembly of applicable models (ironically the feature intended to reinforce proper collimation).

A simple thing really. It's the brace's bolt connecting the objectives. If it's loose or not tightened at the barrels' optimal distance the binocular loses collimation.

In my case it was a fairly easy fix. When the bolt is loose/loosened it allows some play between the fat ends.

Gently pushing them in or out while viewing will show whether the objectives (hopefully only laterally) need to be locked closer or farther apart. Note: check that the connector at

the bar's other end is also secure.

FWIW, this 80mm nok, purchased from one of the big 3 for \$189, attained conditional alignment with the barrels locked 30mm apart. It's a good bet that the bargain priced counterparts are at least as susceptible.

I'm not especially advocating this repair approach.

In fact, I recommend sending such an instrument back and asking for a properly inspected model to be mailed asap with free overnight shipping.

But in this case it was a quick fix, the bino remains aligned, the song remains the same, and we have another fun insight into the wonderful world of miscollimation.

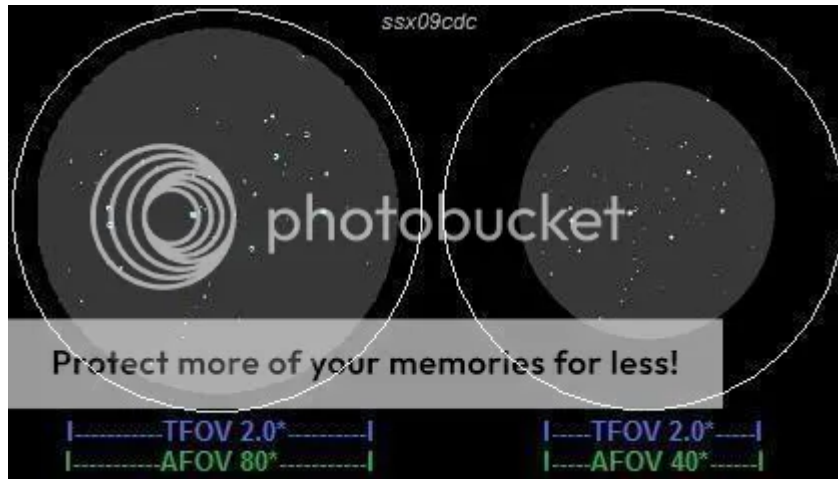
### *one person's miscollimation is another's elation...*

I remember one starparty visitor who brought his own 7×50 binocular which he insisted was easily revealing the four separate main component stars of Orion's Trapezium (a feat requiring the visual acuity of the Bionic Woman).

A suspicion was confirmed as I looked through the horribly misaligned barrels. Everything had separate components.

The kaleidoscopic view made me nauseous, but the excited man was perfectly content to continue with his 'bonus' abundance of stars.

### *true vs apparent fov...*



### *quickie field conversions...*

ft/1000yds:

example: 262 = 5.0° TFOV  
(ft divided by 52.5)

m/1000m:

example: 88 = 5.0° TFOV  
(m divided by 17.5)

\*\*\*\*\*

## SELECTED BINOCULAR REVIEWS

### **Garrett Optical 20×80 UL**

The Zach Attack 20×80 UL exudes both quality and elegance. One would also be hard pressed to find better packaging for their mail orders. High marks for smooth, secure mechanics and excellent field sharpness. Unbridled from its pedestal, these 80mm stallions also make for a sweet ride during casual freehand excursions.

[My fetish for freehanding big glass often gets the better of me. Mounting (or using image-stabilized) binoculars is always recommended for the steadiest image, especially at higher magnifications]

I did find two notable spec discrepancies that may or may not be specimen specific; The listed TFOV (3.2 deg) and ER (16mm) respectively measured closer to 3.0 deg and 14mm. Neither variances were dealbreakers for me.

Fast shipping and GO's personal service accentuated this satisfying \$179 transaction.

### **Oberwerk 20×80 Standard (vs GO 20x80UL)**

Dead heat with the GO 20x80UL for performance, mechanics, FOV/ER (both still shy of spec), and coatings. I found this interesting as the two \*look\* very different. At 15"/38cm, the Obie is some 3" longer with a leaner appearance. The increased length changes the ergonomics noticeably but not detrimentally. After adjusting my hand placement along the barrels I find the two equally comfortable for handheld use. Also despite the longer focal length, both binoculars show comparable field sharpness (85-90%) and daytime/lunar chromatic aberration (not fatal, but present).

Both models are highly recommended.

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### **Orion 30×80 MegaView**

Out of the box, as expected, the 30s are physically very similar to Orion's 16×80 with a couple of exceptions. The slightly heavier weight (just under 6 lbs.) is a product of the center rod bracing the bino lengthwise, along with the adjustable captive weight-balancing pedestal that couples directly to a tripod. Another elegant and functional addition are the extendable thick rubber dewshields at the end of each barrel. Even when retracted they make for excellent bumpers to protect the objectives while bringing the total outside barrel diameters to 92mms. Deploying the dewshields also takes the full height of the formidable and solidly constructed instrument to 14 inches. The trademark leather-textured surface of the main body complements an efficient and attractive all black design.

The supplied hard case is nice, but the MegaView and I would feel more secure with a thick, foam-lined aluminum case to protect its crucial collimation during transport.

While the snug fit of all four eyecaps was a plus, I wouldn't trust the surprisingly thin neckstrap provided with supporting the bino's substantial bulk. (These token neckstraps are thrown in for completeness' sake. Very few people would enjoy being repeatedly jabbed in the chest with that pedestal.)

The fully-multicoated instrument reflects deep blues and greens at the business ends and yields the perfect circles of an unobstructed light path at the lenses. The hinge, center-focus, and diopter all adjusted smoothly, securely, and with no play. I've actually come to expect this from Orion. I now own four of their binos and, if not top-of-the-line optically, their consistent mechanical quality has been very commendable. The good-sized 20mm eyepiece lenses also sport 14mms of eye relief. This is close to ideal for me, although probably a bit short for eyeglass wearers to take in the entire field.

I'm a nitpicker for collimation, and 30x binos leave little room for error, especially after a 3-day FedEx journey. So I was immensely relieved to receive these MegaViews in fine alignment. Aberration tests did reveal slight but noticeable pincushioning across an otherwise very sharp (to about 80%) field. There was an expected and substantial amount of false color on high-contrast daytime objects and our moon attributed to the high magnification (for 5 bills it'd be nice if they'd spring for some apo lenses), but it was no more offensive than the inherent chromatic aberration found in some comparably fast 80mm short-tube scopes at lower powers. And for me the CA took a backseat to the increased resolution, wealth of additional stars, and depth of detail seen on Luna under the night sky.

The 50% jump in magnification from 20 to 30x seems even more significant than that noticed between 10 and 15x power binoculars. Catching our moon at the right illumination, Clavius' arched quintet of inner craters are obvious and distinct. Orion's Trapezium splits cleanly and effortlessly into its 4 major components and, while Cassini's seems just out of reach, a well-resolved Saturn presents a crisp disc and ring system. Jupiter's main belts are prominent and on the verge of showing structure. Despite their relatively small 2.7mm exit pupil and Luna's gibbous interference, the MegaViews still gathered a respectable conglomeration of stars while previewing the Double Cluster, Pleiades, M46/47, the Auriga clusters, and M35. I eagerly anticipate watching them gobble up these treasures and more under a dark sky and plan on letting them run wild thru a moonless Messier Marathon this spring. Upon receiving their Solar filters, I'm also looking forward to my enhanced views of our sun's daily activity.

While the 30x80s are advertised as having a 2.3 degree field, I could almost- but not quite- squeeze Orion's belt stars within the fieldstop yielding a more accurate and happily accepted 2.5 degree field. This yields an AFOV of 75° and is indeed one of the widest views I've experienced. The porthole effect reminds me of Naglervision (albeit without the superior field edge sharpness).

A tripod is, of course, required for unwavering views with this instrument. Any generic but heavy-duty model should work fine. My ProMaster 6600 bought at a local camera store provides more than sufficient support.

First Impressions verdict: Four out of five stars. While pricey, they are only \$20 more than the 15x80MVs, solidly built, mechanically excellent, and ready to mount without an adapter. The beneficial and protective extendable dewshields are a welcome feature. It loses points for heavy CA on Luna, Jupiter and the brightest stars. But aside from the lack of color correction on those targets, the 30x80 MegaViews give rewarding and impressive binocular views of our moon, brighter planets, and the many Messier-class nightsky treasures.

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### **Glass At A Glance: Pentax 20x60 PCF WP11**

\$169 from amazon.com  
instrument arrived promptly, well-packaged,  
mechanically sound, and in fine collimation

bak4/fmc/no light path interference  
dimensions 9.0x7.75"  
weight 45oz/1275grams  
ipd 57-72mm/ lens diameter 18mm  
center focus/clickstop diopter  
exit pupil 3.0mm  
eye relief 18mm useable  
min focus 8m  
spiral clickstop eye relief adj  
no eyeguards  
nitrogen filled/weather resistant  
very sturdy construction  
sleek black rubber armored housing

tfov 2.4° (spec 2.2°)  
field sharp to 95+% [comparable  
to orion 15x63 mini-giants]  
minimal positive distortion  
afov 44° (spec)  
afov 48° (adj) restricted but not necessarily a  
dealbreaker. no serious tunnelvision, but more  
than i'm used to.  
false color: present but minimal  
ergonomics: easily handheld for casual obs  
(tripod is always recommended for steadiest views)

purchase motivations:  
compulsive interest  
comparison to 20x80s

notes: the obie 20x80 std trumps the pentax  
in tfov/afov/depth of field and image brightness.  
the pentax 20x60 has the edge in overall field

sharpness and color correction along with being much smaller and lighter. the plentiful ER is overkill to take in the smaller fieldstop perimeter but i doubt any eyeglass wearers would complain.

tip of the day:

WP noks may be WP on the inside, but the outside surfaces are still at the mercy of fog and condensation. storage in a secure garage or vehicle is recommended to keep all optics as close as possible to ambient temps and humidity

bottom line:

five star transaction and instrument highly recommended with caveat of potentially restrictive tfov/afov

\*as always, ymmv\*

\*\*\*\*\*

### **Minolta 8×40 Activa WP**

Cruising the net for a quality complementary wide field instrument led me to this \$110 gem from the Minds of Minolta.

With BAK4 prisms and longer eye relief, the fully multicoated and weatherproof Activa series is an impressive upgrade from their venerable Deluxe (Classic) line of binoculars.

Out of the box, the all black rubber-armored Minolta is a class act, including a very nice soft-lined case and deluxe neckstrap.

Weighing in at a well-balanced 27oz., it first reminded me of a less bulky and more ergonomic version of the Orion UltraView.

The Activa's hinge, focus, and diopter adjustment (which lightly clicks into place at small increments) is smooth and secure. The caps also all fit securely. A single cover takes the place of dual lens caps.

In lieu of roll-back eyeguards, the Activa is equipped with soft rubber twist-lock eyecups to customize eye relief. Rather than spiraling freely, the eyecups again securely click into place over four incremental positions. Very handy.

I'm not a big fan of optics being shipped in a thin layer of styrofoam peanuts, but the Activa and its collimation managed to survive the UPS journey unscathed.

The very bright and vivid daytime, stellar, and Lunar images show negligible false color across nearly the entire 8.2° (spec and measured) field of view. Only the slightest pincushioning was detected over an otherwise very sharp (to 85%) field.

Noticable prism interference at the exit pupils is limited to a slight diagonal flattening at 1 o'clock (L) and 11 o'clock (R).

While the eye relief is long (spec states 18.5mm), the moderate lens recess tweaks the usable ER closer to 16mm. Wearing thin sunglasses I could still comfortably take in the entire field stop with the twist-locks fully retracted.

A generous 22mm lens diameter, interpupillary range of 58-72mm, and plenty of room to gaze around the field contributes to the comfortable ergonomics. In addition, I find the 65° apparent FOV very acceptable and immune to any tunnelvision.

Those in the market for a full featured, well-constructed, and sharp looking binocular under \$150 will not be disappointed.

UNDER THE STARS

I spent an enjoyable 2 1/2 hours breaking in the 8×40 under mag 5 skies, running the latter third of the marathon Messiers and brighter NGCs.

Early impressive observations of note included the Coma cluster, Messiers 3, 5, 13, 12, 10, 4, ic4665, ngc6633, and doublestars alphaLib, epsilonLyr, nuDra, and omicronCyg.

A very pleasing tour through the Summer Triangle was highlighted by Cr399, M27, and hints of the North American and Veil nebulae. A slow, climactic cruise down the Sagittarius Arm's main drag followed through Messiers 11, 26, 16, 17, 18, 24, 23, 25, 21, 20, 8, 7, and 6. All were easily identified, resolved to various degrees, and found flowing over the expanse of about 3 binocular fields.

The Messier cottonball globulars 22, 55, 15, and 2 also stood out beyond simple detection. Uranus and Neptune were also spotted about a degree from, respectively, 4th magnitude suns lambdaAqr and iotaCap. The gas giants soon ushered in our waning crescent moon in close conjunction with Mars.

A handful of satellites and a couple of stray meteors also joined this session's festivities.

After a northeast sweep thru the rising stars of Cassiopeia and a low, early season preview of M31, the Minolta and I called it a night.

Generously rating the transparency 8/10, the Messier globs and OCs were all at least obvious while the dimmer galaxies and nebulae hid behind the early summer haze. As anticipated, the aesthetic context of a 8+° field and effortless starhopping was a fair compromise for the sacrificed brightness and resolution of my larger instruments.

As a former obsessed fuzzy hunter and long-time big bino enthusiast, this 8x session made me realize how little time I spend seeing more of the celestial forest through the trees. Always refreshing to throw a different perspective into the mix.

I would also recommend an 8×40 as an excellent first binocular for beginners learning their way around the night sky.

To sum it up: A small price for alot of field and alot of fun.

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### **Barska X-Trail 30×80**

A Big Brown Truck arrived with my new toy earlier this week.

Coddled in bubble-wrap within its hard-case, the 30x Barska survived the trip without a scratch and in fine collimation...

I could stop there as, for \$139, my expectations had already been met.

But as the audition progressed, I became increasingly pleased with the performance of these bargain Giants. So here we go.

#### Vital Stats

Max Dimensions: 13"x9"

Weight: 4.3 lbs.

Min Focus: 49 ft.

All black, streamlined, soft and smooth rubber housing.

Extremely ergonomic and well-balanced.

Aroma: Confidential (Sorry, Kenny.)

Lifetime Limited Warranty

Mechanics: Hinge, focus, and diopter motion secure with no play. Caps all secure. Easy-to-adjust pedestal stays secure along center bar.

BAK4 Prisms (round exit pupils, no light path interference).

Coatings: MC. Despite various specs and speculation, the objectives do indeed present healthy bluish-green reflections thru its black-baffled barrels. Lens and prism paler blue reflections, however, indicate single-

coatings on some surfaces.

Optics (daytime): Very bright images. Moderate pincushioning. Very well color-corrected. Minimal off-focus purple fringing.

### Eyegonomics

FOV: 2.1° (spec) 2.2° (measured)

AFOV: 63° (per spec) 66° (adj)

F/FSR (Field to Field-Stop Ratio): Average. No tunnelvision, but not a spacewalk either. Field-stop is well-defined.

Eye Relief: 10mm (spec) 9mm (useable. recess is slightly less than 2mm, and I'm feeling generous)

Lens diameter: 20mm

Exit Pupil: 2.7mm

IPD: 58-72mm

Comfort: Very good. Long, soft roll-back rubber eye cups.

Vignette: Minimal. Eye positioning is more forgiving than expected.

My favored useable eye relief is in the 12-14mm range, so the Barska is tighter than I prefer (any less would be painfully tight). Not recommended for eyeglass wearers, I would estimate at least a 50% loss of field.

### Under The Stars

Pinpoint star images out to 75% of field.

Minimal violet fringing on Jupiter and Vega (substantially less CA than my \$500 MegaView).

Main Jovian bands are distinct, showing both color and hints of texture.

Negligible false color at Luna's limb; our waning gibbous moon is splendidly detailed.

### Versus Orion 30x80MegaView

For another \$350, the MV provides 4mm more eye relief and a significantly larger AFOV (fieldstop is nearly peripheral). These are two important qualities for me and worth the extra cost. YMMV.

The MV also provides an additional .3° TFOV, and includes extendable dewshields.

Except for the above, the sleek and lightweight Barska 30s not only challenge the heavier MV's optics, mechanics, and quality build, but do so with better color correction (the trade-off, as expected, is increased internal reflections around the bright stuff).

### Handheld Use

I spent ten straight minutes standing and another 30 on my back enjoying a relaxed freehand crawl across the available constellations. Very liberating. At just over 4 lbs, they simply do not feel like Giants.

Bino Forum edicts require me to reiterate that a tripod or IS is always recommended for more serious bino-target study.

Following that, the Barska's mounting requirements are minimal; any tripod rated for even 5 lbs will suffice.

### Summary

Aside from an incurable giant bino fetish, I also wanted to occasionally share 30x binocular views with the public without putting my more valuable MV in harm's way. The Barska X-Trail 30x80 will serve this purpose with flying colors. More bang for 139 bucks than I expected.

If the MegaView drives like a Cadillac, then the Barska handles more like a sports car.

Recommended with the caveat of potentially restrictive eye relief.

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## **Glass At A Glance: Oberwerk 11×56**

\$99 from bigbinoculars.com  
instrument arrived promptly, well-packaged,  
mechanically sound, and in fine collimation

bak4/ fmc/no light path interference  
height 7.75×8.0"/19.7×20.3cm  
weight 36oz/965grams  
ipd 56-72mm/ lens diameter 20mm  
center focus/diopter  
exit pupil 5.1mm  
eye relief 17mm useable  
min focus ~10m  
soft rollback eyeguards

tfov 6.1° (spec 6.0)  
field sharp to 85%  
coma free field 5.5°  
nominal positive distortion  
afov (spec) 66°  
afov (subj) v good. not a spacewalk but no  
tunnelvision. fieldstop is well-defined  
false color: present but minimal  
ergonomics: no complaints; it's 11x at just  
over two lbs. easily handheld for casual obs.  
perhaps a bit large for children.  
as fortune would have it, the image scale and  
tfov fall about halfway between my 8s and 15s.

purchase motivations:  
compulsive interest  
additional outreach noks to pass around  
it was kevin's turn to get my money

tip of the day:  
this bino only rates a soft case. with these cases  
i habitually cut and pop enough bubblewrap to  
surround the bino lengthwise before sliding it in  
the case for storage and transport (protection  
and keeps the caps on when taking it out)

bottom line:  
five star transaction and instrument  
highly recommended

\*as always, ymmv\*

\*\*\*\*\*

**Barska 15×70 X-Trail: Big Bang For The Buck**

I really didn't need another binocular.

I have plenty of binoculars, actually.

Among them is a perfectly wonderful 30×80 Barska X-Trail.

But I was ready to take one for the Forum team after reading a few recent Barska horror stories, and was fully prepared to pull a broken string of parts out of the box when my 15x70XT arrived.

I found the Barska 15s on sale at Amazon for \$49 and haphazardly pulled the trigger. If this negligent, impulsive purchase wouldn't get me a lemon then nothing would. \*professional stuntman. do not try this at home\*

Three days later a big brown truck delivered another perfectly wonderful specimen.

Well-packaged, collimated, and mechanically sound. Includes soft case, neckstrap, table tripod, adapter, and cleaning cloth.

Looks great next to its 30x big brother, too.

### Vital Stats

Max Dimensions: 11"x8.5"

Weight: 2.8 lbs

Min Focus: ~50 ft

Design: All black, streamlined, soft and smooth rubber housing.

Ergonomic and well-balanced for its size. No center pedestal. Center focus.

Prisms: BAK4 (round exit pupils, no light path interference).

Coatings: Fully coated/light blue reflections at both ends

Optics (daytime): Very bright images. Very good color-correction across a flat, relatively wide FOV. Minimal pincushioning; it could actually use a little more. There's a subtle center field softness compared to my instruments with higher positive distortion.

### Eyegonomics (measured)

FOV: 4.4°

AFOV: 66°

F/FSR (Field to Field-Stop Ratio): Very Good. No tunnelvision, but not a spacewalk either. Field-stop is well-defined.

Lens diameter: 20mm

Exit Pupil: 4.7mm

IPD: 56-72mm

Comfort: Very Good. Long, soft roll-back rubber eye cups.

Eye Relief: 18.5mm (useable).

Vignette: Minimal. However, without eyeglasses the eyeguards must be extended to achieve the proper viewing distance. I always leave the eyeguards extended anyway and take this in stride, but it may be more important to others.

### Under The Stars

Pinpoint star images out to 80% of field.

Negligible false color at Luna's limb. Our waning gibbous moon is splendidly detailed and star colors are vivid. The Pleiades, Double Cluster, and Orion Nebula are beautifully framed.

### Versus 15×63 Orion MG

I'm not quite comparing apples to apples here.

Both have comparably long eye relief and pleasing eyegonomics.

Both also provide comparable brightness; the Barska's extra aperture

helps compensate for the Orion's better coatings/contrast (the XT's exit pupil is also a half-millimeter larger). The Orion is much lighter, more compact, and has the edge in ergonomics, while the larger and heavier Barska provides an extra .5° FOV.

The Orion shows almost no internal reflections (FMC) but an increase in chromatic aberration on Luna and the brightest stars/planets.

These trade-offs all come down to personal preference.

#### Handheld Use

Weighing-in at less than 3 lbs, I manually swept the night sky standing for a half-hour before even realizing that I'd manually swept the night sky standing for a half-hour. A very liberating and enjoyable ride.

The Barska's mounting requirements are minimal; any tripod rated for even 5 lbs will suffice.

#### Summary

My best mid-power bino investment for the price.

For those that can handle occasional internal reflections better than false color, I would easily consider the Barska 15x70XT as one of the best mid-power instruments available under \$100.

And a steal at \$49.

Highly recommended with the standing caveat to buy from a reputable dealer that will personally check the mechanics and collimation prior to shipping. Buy and test locally if possible.

\*\*\*\*\*

*[as good of place as any to put this. enjoy.]*

#### **Observing Under the Influence: The Apogee 18×50 Beer Bottle Telescope**

I got the sweetest lil' early stocking-stuffer for this Christmas.

Apogee's famed, novelty 18×50 BBT.

I'm having a blast with it.

The following may or may not be considered my review.

#### Vital Stats

Primary Mirror: 50mm

Magnification: 18x (fixed)

Focal Length, Ratio: 235mm, f/4.7

Max Dimensions: 8.5" x 2.5"

Weight: 10 oz.

Min Focus: 8 ft.

Price: \$21.95

Apogee Transaction Rating: 4/5. Prompt delivery and good communication.

Despite arriving undamaged, the inner packing did not surround the product.

Out-Of-Box: Very nice heavy-nylon black case. Includes shoulder strap and cleaning cloth. The scope is green (I haven't decided which shade yet), more rugged than expected, and, coincidentally, shaped like a beer bottle- including the eyelens cap which pops on and off. A dribble-hole along the main tube doubles as a quarter-inch adaptee for possible tripod mounting.

Coatings: Fully Coated optics (decent blue tint from each end).

Eyegnomics: In this specimen, the field of view is a pleasantly-flat, correct-image 3.5°, and coma-free out to 75%. No on-axis astigmatism detected. Negligible false color. Nominal pincushioning. Exit pupil is 2.7mm. Apparent field is an adequate 63°; Fieldstop is sharp. No tunnelvision, but not a spacewalk either. But you have to get \*to\* the FOV first.

I found the 5mm lens recess to yield a useable eye relief of about 5mm. In addition, the eyelens diameter is a mere 12mm. This inconvenience is only offset by the lack of an eyeguard and ability to shove the tapered neck right into your eyeball.

Ergonomics: About what you'd expect. It's about as comfortable as holding an empty beer bottle up to your eye can be. Using both hands and adopting a *Master and Commander* pose is almost irresistible.

Will I Look Silly Using It: Not if you're alone. At night.

But seriously, most folks would probably just pity what would appear to be a pathetic drinking problem. Add an eyepatch (to view comfortably with both eyes open) and passersby might start charitably tossing coins at you as well.

Will I Feel Silly Using It: There's a good possibility ("But I don't wanna be a pirate..."). Using the BBT is kinda like owning a moped; fun to ride, but you don't want your friends to see you with one.

Mechanics: The secure caps are made of hard plastic. The smooth and secure focusing is attained by rotating the top half of the bottleneck.

That's about it for mechanics.

Nothing rattling around inside.

The velcro on the cool, black case also performs admirably.

Mounted on an EQ2, my only complaint was having to listen as my nearby StarMax was laughing its aperture off.

Storage: In its cool, black case. The mini-scope doesn't match anything in the house. Did I mention the weird shade of green?

Viewing from a dark, transparent sky is, of course, recommended- and does alot to compensate for the lack of aperture and relatively small exit pupil.

The BBT also tests ones true starhopping mettle. At 18x, it's a shaky handheld ride until you put in some practice. I happen to love the challenge, and even plan on competing in next spring's Marathon with it. Alone. Stay tuned.

For a \$20 novelty astro-gift, the Apogee Beer Bottle Telescope actually has alot to offer as a practical stargazing instrument.

I can only hope the already-suspicious Illinois State Police that frequent my favorite rural site show the same appreciation (after I'm forced to take a breathalyzer test).

Happy hunting, and *Cheers*.

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### **Kronos 26×70: Requiem for Eye Relief**

An ongoing quest to discover more relatively lightweight and inexpensive high power binoculars led me to audition the Kronos 26×70. At \$199, they will not break the bank. At 3.7 lbs (1.7 kg), they are certainly lightweight.

Unfortunately, insufficient eye relief spoils an otherwise favorable test drive.

All black and all business, the Kronos' leather-textured surface and design is very attractive. The enclosed certificate of authenticity and specs were written in Russian as well as English. Along with the Russian font on the casing, I imagined feeling quite comfortable using these on the deck of the *Red October*.

I was mildly surprised that the 26×70 only rated a basic nylon case. Included was a somewhat undersized single-stem adapter that could be screwed onto a tripod at one end and clamped around the hinge at the other. But for mounted use I would probably opt for a standard steel L-adapter. On the plus side, all four protective lens caps kept a tight fit despite my semi-violent attempts to shake them loose.

Mechanically, I gave this unit a split-decision. The hinge was quite rigid and reluctant to flex, while the individual focus on both eyepieces was somewhat slippery and unsecure.

The bino's objectives are multicoated, and gazing down the barrels reveal a pinkish-purple tint. Tight circles of an unobstructed light path greeted me at the lenses, but then, any prism interference would be an unforgivable design flaw with the already limited exit pupil.

Perfectly merged terrestrial and stellar images showed the barrels to be in solid alignment. While I could make out the smallest cracks in neighboring chimneys, there was a substantial but not fatal degree of pincushioning. Chromatic aberration was very tolerable, with only minimal green and red boundaries seen around high-contrast objects and the available lunar crescent.

The Kronos' specs cite a 2.5 degree tfov, but I managed to squeeze Orion's belt within the fieldstop, yielding a more accurate 2.7 degrees. Stars remain pinpoint across 85% of the field. Apparent field- by no means narrow- is still somewhat optimistic for the adjusted 70 deg quotient. A lack of full multicoatings is evident in the overall brighter background, but with the abundance of additional stars pulled in at 26x this is more easily forgiven.

In the minority and/or acclimated from cutting my teeth on 6 lb. Orion Giants, I found the comparably lightweight Kronos' to be an ergonomic handheld ride despite the high magnification (translation: 99% of the population will need a tripod).

Luna is wonderfully large, sharp, and intricately detailed. Jove reveals two distinct and structured bands, while Saturn shows a tiny but crisp disc and ring system.

I also did not find the relatively small 2.7mm ExP to be a hinderance. Astronomically, the forte of these noks is not to track down diffuse fuzzies, but rather to enhance resolution and detail on Luna, the planets, clusters, and globs. The Kronos does this well.

Although I don't wear glasses, I still prefer a generous amount of eye relief. Listed at 9mm, I was more wary of the actual usable ER. It was a bad gamble. First, the lenses are recessed about 2 millimeters. In addition, the stubby eyeguards extend 6mms and cannot be rolled back. In other words, they were too short to be very useful at blocking peripheral light but long enough to decrease the already short ER. By masochistically wedging the eyepieces into my sockets I could take in the entire field stop. Comfortably and without brushing my eyelashes on the lens I could see maybe a third of the total field. I had thoughts of removing the eyeguards and replacing them with winged models, but ultimately felt the lack of ER would be a constant source of frustration.

This was unfortunate as I was otherwise pleased with the Kronos' performance, weight, and price. With even 10-12mms of eye relief, however, the Russian Giants would've been keepers. But as they say, Вы не можете выиграть все их (you can't win 'em all).

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### **Glass At A Glance: Orion Giant View 25×100**

\$349 from telescopes.com

instrument arrived promptly, well-packaged,

mechanically sound, and in fine collimation

aluminum case for transport

bak4/ fmc. orion does not skimp on coatings-

there is barely any reflection at the business ends.

height 17.1 in

weight 10.1 lbs

individual focus/integral mounting post

exit pupil 4 mm

ipd 61-72mm

eye relief 17 luxurious useable mms.

i'm happiest with 12-14mms of UER plus a few more to take advantage of leaving the eyeguards out to block peripheral light. the orion does not disappoint. the large 20mm eyelens diameters contribute to the excellent viewing experience.

editorial:

i pay to see the field stop, even if the outer fov is just for context. those designing noks with 9 or less mms of ER should be subjected to viewing the fieldstop regardless of ocular bone damage or disfigurement.

i keep imagining a think-tank of designers intentionally ignoring every new models' ER specs and, for entertainment purposes, creating a betting pool as to the final distance outcomes ("okay boys! who had 11mms?").

close focus 100 ft

soft rollback eyeguards

tfov 2.5° (spec )

field sharp to 80%

coma free field 2.0°

nominal positive distortion

afov (spec) 63°

afov (subj) v good. not a spacewalk but a substantial view relative to the limited tfov. fieldstop is well-defined

false color: present but minimal

ergonomics:

braced on my elbows-tripod or reclined, the increased weight actually serves to help stability when held near the objectives.

(a heavy-duty tripod is required for best detection and detail)

purchase motivations:

giant bino addicts must have at least one 100 mm horse in their stable. it's the law.

high mag handheld training, especially as a warm-up session before powering down to lower mag noks.

after spending 15-20 minutes with the 25×100- regardless of the actual physiological stability increase- views thru my 15s and 20s certainly feel lighter and seem steadier. often reaching 'heartbeat-limited' stability.

bottom line:

10 lbs of heaven

five star transaction and instrument

highly recommended

\*as always, ymmv\*

\*\*\*\*\*

**Glass At A Glance: Zhumell 20×80**

\$99 from binoculars.com  
instrument arrived promptly, well-packaged,  
mechanically sound, and in fine collimation  
hard liner in leather case

bak4/fmc (spec). this specimen is a  
tongue-in-cheek fmc; multicoated obj/fully  
coated prisms and lens  
no light path interference  
height 13"x9"/33cmx23cm  
weight 4.4lbs/2.0kg  
ipd 56-72mm/ lens diameter 20mm  
exit pupil 4.0mm  
eye relief 16mm useable  
min focus ~20m  
center focus/pedestal/center brace  
soft rollback eyeguards

tfov 3.2° (spec 3.2°)  
field sharp to 75%  
coma free field 2.5°  
negligible positive distortion (just this side of neutral)  
afov (spec) 64°  
afov (subj) no tunnelvision but not as panoramic  
as spec might suggest. fieldstop is well-defined  
false color: present but minimal  
ergonomics: handheldable for casual use and hotdogging at star parties, but tripod is recommended (any  
standard camera/video tripod will suffice).

purchase motivations:  
see what all the fuss is about  
second Z20x80 subsequently purchased as  
donation to local astroclub's rental program

tip of the day:  
along with ideally helping preserve collimation, the  
lengthwise bar on crossbraced models can be held as a vertical support for freehand viewing (sliding the  
pedestal all the way forward). the opposite hand steadies the horizontal and controls focus. the bar also makes a  
convenient carrying handle for out-of-case transport

bottom line:  
five star transaction/four star instrument  
recommended bang for the buck purchase  
weak afov and outer field sharpness compared to  
the obie and garrett counterparts but still qualifies  
as an adequate instrument for general stargazing.

\*as always ymmv\*

[note: the barska 20x80xt auditioned rates a nearly identical review.  
also see 'a tale of four 20s']

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## **Orion 15×63: A Mini-(Giant) Revelation**

I'd lugged my 16x80s around for over 10 years.

Freehand or mounted, I'd never given a second thought to their 5+ lb. mass. In fact, I'd always related the healthy bulk of these giants as a sign of their powerful optics and construction.

So my first thought upon hefting the mere 41 ounces of the Mini-Giants from their hardcase was, "Are they serious?"

They are.

The relatively light weight is nicely balanced along an 8 3/8" sleek and streamlined body. (Actually, the Mini-Giant series appears to be the revamped FMC big brothers to the popular Orion Scenix line of binoculars.) As advertised, they are easily hand-holdable for several minutes at a time. Although tripod-adaptable, I doubt I would ever have to use them mounted.

Still suspicious, I thought there must be some trade-off (specifically, prism interference) to this contoured design. But there was none. Full circles of light greeted me at the lenses and not a millimeter of obstruction was present while gazing down the black-baffled barrels.

The hinge, focuser, and diopter adjustments all moved smoothly and securely with no play, and, although I'm very sensitive to collimation, I still slowly alternated closing and opening each eye to find the merged image in perfect alignment.

Aberration tests also showed no excessive pincushion or barrel-effect across the 3.9° (measured) field, and color-correction is confined to minimal slivers of green and red on high-contrast daytime objects and Luna. I've never put too much faith in AFOV specs, and the MG is a good example why. A pleasantly wide apparent field belies the modest 58° (adj) quotient. Serious field distortion/coma is limited to the outer 5% of the field, and only really noticable if you go looking for it.

There is no lunar ghosting, and our moon's entire terminator is sharp with detail. The Orion Nebula, Pleiades, and Double Cluster are all amply framed with pinpoint star images. All very impressive.

I just kept waiting for 'the trade off' and, aside from losing 17mm of aperture and half the weight of my 16x80s, found none.

Also, as advertised, the Mini-Giants have plenty of eye relief (18mm useable). Highly recommended for eyeglass wearers. However, without glasses, the eyeguards must be extended to achieve the proper viewing distance without vignette. I always leave the eyeguards extended anyway, and can live with this, but it may be more important to others.

Again, I'd lugged my 16x80s around for over 10 years.

They've been with me through 30 states, Canada, Mexico, and the Caribbean. They've witnessed many comets, occultations, and eclipses over their lifetime. Mounted, they've impressed hundreds of starparty guests and friends with their size, power, and optics.

They rock.

And I would never let them go.

And they will always remain mounted near my scope for public viewing.

And I'm not just saying this because they're giving me the evil-eye while I'm writing this.

Nevertheless, in summary, I recommend the excellent optics and lightweight ergonomics of the Orion 15x63s (at around \$200) as a competitively-priced alternative to many of the much heavier and tripod-dependent giant binoculars in this magnification range.

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## **150 Doublestars For Binoculars Stephen Saber**

*[sigmaOri courtesy of DSS]*



Given a magnified visual acuity of 150" a 10x binocular will potentially split doublestars with separations as close as 15" (150/10), and 5" at 30x.

Doubles with equal or near equal mags are easier to blackline than those with a significantly brighter glare from the primary. Color interpretations are often subjective for several reasons including sky conditions, color sensitivity, contrast effects, and aperture.

Equally impressive in low power scopefields, this collection of brighter targets for northern observers is arranged by constellation and decreasing separation.

Pocket Sky Atlas chart references are included.

### **Andromeda** *psa 2/3*

56 0156+3715 5.7, 6.0 @ 190"

59 0211+3902 6.5, 7.0 @ 16.6"  
gamma 0204+4220 2.3, 5.5 @ 9.8"  
stf79 0100+4443 6.0, 7.0 @ 7.8"

### **Aquarius** *psa 76*

94 2319-1327 5.3, 7.3 @ 13"  
107 2346-1840 5.5, 6.5 @ 6.6"

### **Aquila** *psa 65/66/67*

15 1905-0402 5.5, 7.2 @ 38"  
57 1955-0814 5.8, 6.5 @ 36"  
stf2654 2015-0330 6.0, 7.5 @ 14.2"  
5 1847-0057 5.5, 7.5 @ 13"

### **Aries** *psa 4*

30 0237+2439 6.6, 7.4 @ 38.6"  
lambda 0158+2336 4.9, 7.7 @ 37"  
gamma 0154+1918 4.8, 4.8 @ 7.8"

### **Auriga** *psa 12*

stf698 0525+3451 6.5, 7.5 @ 31.2"  
stf764 0541+2929 6.5, 7.0 @ 26"  
14 0515+3231 5.1, 7.4 @ 14.6"  
stf872 0616+3609 6.9, 7.9 @ 11.3"  
41 0612+4843 5.0, 7.0 @ 7.7"  
stf918 0634+5227 6.5, 7.5 @ 4.7"

### **Bootes** *psa 42/44/53*

mu 1525+3723 4.3, 6.5 @ 108"  
s656 1350+2117 6.8, 7.3 @ 86"  
iota 1416+5122 4.9, 7.5 @ 38"  
stf1850 1429+2817 6.0, 7.0 @ 25.6"  
kappa 1414+5147 4.6, 6.6 @ 13.4"

xi 1451+1906 4.7, 7.0 @ 6.9"  
stf1835 1423+0827 5.1, 7.6 @ 6.2"  
pi 1441+1625 4.9, 5.8 @ 5.6"

**Camelopardalis** *psa 11/12/31*

11/12 0506+5858 5.4, 6.5 @ 180"  
s436 0349+5707 6.5, 7.3 @ 58"  
32 1249+8325 5.3, 5.8 @ 21.6"  
1 0432+5355 5.7, 6.8 @ 10.3"

**Cancer** *psa 24*

b584 0840+1933 6.9, 7.2 @ 45"  
iota 0847+2846 4.2, 6.6 @ 30"  
stf1245 0836+0637 6.0, 7.2 @ 10.3"  
zeta 0812+1739 5.6, 6.0 @ 5.9"  
phi2 0827+2656 6.3, 6.3 @ 5.1"

**Canes Venatici** *psa 32*

17 1310+3830 6.0, 6.2 @ 84"  
alpha 1256+3819 2.9, 5.5 @ 19.4"

**Canis Major** *psa 27*

h3945 0717-2320 5.0, 5.8 @ 26.8"

**Capricornus** *psa 66*

beta1/2 2021-1447 3.4, 6.2 @ 205"  
omicron 2030-1834 6.0, 6.5 @ 21.9"

**Cassiopeia** *psa 1*

oss26 0220+6002 6.9, 7.4 @ 63"  
stf3053 0003+6605 6.0, 7.7 @ 15.2"  
eta 0049+5749 3.4, 7.5 @ 12"

**Cepheus** *psa 71/73*

delta 2229+5825 3.9, 6.3 @ 41"  
stf2840 2152+5547 5.5, 7.3 @ 18.3"  
beta 2129+7034 3.2, 7.9 @ 13.3"  
xi 2204+6438 4.4, 6.5 @ 7.7"  
stf2816 2139+5729 5.6, 7.7, 7.8 @ 11.7", 121"

**Cetus** *psa 6*

66 0213-0224 5.7, 7.5 @ 16.5"

**Coma Berenices** *psa 45*

17 1229+2555 5.3, 6.6 @ 145"  
32/33 1252+1704 6.3, 6.7 @ 95"  
24 1235+1823 5.2, 6.7 @ 20.3"

### **Corona Borealis** *psa 53*

zeta 1539+3638 5.1, 6.0 @ 6.3"  
sigma 1615+3352 5.6, 6.6 @ 6.2"

### **Corvus** *psa 47*

stf 1669 1241-1300 6.0, 6.1 @ 5.4"

### **Cygnus** *psa 62/63*

31 2014+4644 3.8, 7.0, 4.8 @ 107", 338"  
16 1942+5031 6.0, 6.2 @ 40.0"  
beta 1931+2758 3.1, 5.1 @ 34.4"  
61 2107+3845 5.2, 6.0 @ 28"  
stf2486 1912+4951 6.6, 6.8 @ 7.9"

### **Delphinus** *psa 64*

s752 2030+1925 6.6, 7.0 @ 106"  
gamma 2047+1607 4.4, 5.0 @ 9.1"

### **Draco** *psa 41/52/61*

16/17 1636+5255 5.4, 5.5 @ 108"  
39 1824+5848 5.0, 7.4 @ 89"  
oss123 1327+6444 6.7, 7.0 @ 69"  
nu 1732+5511 4.9, 4.9 @ 62"  
omicron 1851+5923 4.8, 7.8 @ 34.2"  
psi 1742+7209 4.9, 6.1 @ 30.3"  
40/41 1800+8000 5.7, 6.1 @ 19.3"  
stf2452 1854+7546 6.6, 7.4 @ 5.6"

### **Equuleus** *psa 75*

epsilon 2059+0418 6.0, 7.1 @ 11"

### **Eridanis** *psa 16/17*

55 0444-0848 6.7, 6.8 @ 9.2"  
32 0354-0257 4.7, 6.2 @ 6.8"

### **Gemini** *psa 25*

20 0632+1747 6.3, 6.9 @ 20.0"  
38 0655+1311 4.7, 7.7 @ 7.1"

### **Hercules** *psa 52/54/55/65*

37 1641+0413 5.8, 7.0 @ 70"  
kappa 1608+1703 5.3, 6.5 @ 28"  
100 1808+2606 5.9, 6.0 @ 14.2"  
95 1802+2136 5.0, 5.1 @ 6.3"  
alpha 1715+1423 3.5, 5.4 @ 4.7"  
rho 1724+3709 4.6, 5.6 @ 4.1"

**Lacerta** *psa* 72

8 2236+3938 5.7, 6.5 @ 22.4"

**Leo** *psa* 34/35

alpha 1008+1158 1.4, 7.7 @ 177"

tau 1128+0251 5.0, 7.4 @ 91"

83 1127+0300 6.2, 7.8 @ 28.5"

54 1056+2445 4.5, 6.3 @ 6.5"

gamma 1020+1951 2.2, 3.5 @ 4.4"

**Lepus** *psa* 16

gamma 0545-2227 3.7, 6.3 @ 96"

h3780 0539-1751 6, 9, 8, 8 @ 89", 76", 129"

s476 0519-1831 6.2, 6.4 @ 39"

**Libra** *psa* 57

alpha 1451-1602 3.0, 5.0 @ 231"

shj179 1426-1958 6.6, 6.6 @ 16"

stf1962 1539-0847 6.5, 6.6 @ 11.9"

**Lynx** *psa* 23

5 0627+5825 5.3, 7.9 @ 96"

19 0723+5517 5.6, 6.5 @ 14.8"

stf958 0648+5542 6.3, 6.3 @ 4.8"

**Lyra** *psa* 63

epsilon1/2 1844+3940 5.0, 5.2 @ 208"

beta 1850+2948 3.5, 7.0 @ 46.6"

oss525 1855+3358 6.0, 7.7 @ 45"

zeta 1845+3736 4.3, 5.9 @ 44"

**Monoceros** *psa* 25/26/27

zeta 0809-0259 4.3, 7.8 @ 67"

epsilon 0624+0436 4.5, 6.5 @ 27"

beta 0629-0702 4.7, 5.2 @ 7.3"

**Ophiuchus** *psa* 54/56

rho 1626-2327 5, 8, 7 @ 151", 156"

s694 1752+0107 6.9, 7.1 @ 82"

53 1735+0935 5.5, 7.5 @ 41.3"

61 1745+0235 6.2, 6.6 @ 20.6"

**Orion** *psa* 14/16

delta 0532-0018 2.5, 6.5 @ 52.6"

theta2 0535-0525 5.0, 6.5 @ 52"

shj49 0459+1432 6.0, 7.5 @ 39.4"

stf747 0535-0600 4.8, 5.7 @ 35.7"  
23 0523+0333 5.0, 7.1 @ 32"  
stf855 0609-0230 6.0, 7.0 @ 29.5"  
sigma 0539-0236 4.0, 8.8, 6.5, 6.6 @ 11", 13", 42"  
iota 0536-0555 2.8, 6.9 @ 11.3"  
theta1 0535-0523 6.7, 7.9, 5.1, 6.7 @ 8.8", 13.0", 21.5"  
lambda 0535+0956 3.6, 5.5 @ 4.4"

### **Pegasus** *psa 74/75*

stf2841 2154+1943 6.4, 7.9 @ 22.3"  
stf2978 2308+3249 6.3, 7.5 @ 8.4"

### **Perseus** *psa 12/13*

57 0433+4304 6.1, 6.8 @ 116"  
stf331 0301+5221 5.3, 6.7 @ 12.1"

### **Pisces** *psa 5*

77 0106+0455 6.8, 7.6 @ 33"  
psi1 0106+2128 5.6, 5.8 @ 30"  
zeta 0114+0735 5.6, 6.5 @ 23"  
35 0015+0849 6.0, 7.6 @ 11.6"  
65 0050+2743 6.3, 6.3 @ 4.4"

### **Sagitta** *psa 64*

bu139 1913+1651 6.5, 7.5 @ 113"  
theta 2010+2055 6.5, 7.4 @ 84"

### **Scorpius** *psa 56*

nu 1612-1928 4.3, 6.4 @ 41"  
beta 1605-1948 2.5, 5.0 @ 13.7"  
xi 1604-1122 4.8, 7.3 @ 7.6"

### **Serpens** *psa 55/65*

stf1919 1513+1918 6.7, 7.6 @ 23.9"  
theta 1856+0412 4.6, 4.9 @ 22.1"

### **Sextans** *psa 34*

35 1043+0445 6.3, 7.4 @ 6.8"

### **Taurus** *psa 14/15*

21/22 0346+2432 5.6, 6.4 @ 168"  
eta 0348+2406 2.9, 6.3 @ 117"  
hvi98 0416+0611 6.3, 7.0 @ 66"  
chi 0423+2538 5.5, 7.6 @ 19.4"  
stf401 0331+2734 6.4, 6.9 @ 11.3"  
118 0529+2509 5.8, 6.6 @ 4.8"

## **Ursa Major** *psa 31/42/43*

stf1831 1416+5643 6.6, 7.1 @ 108"  
65 1155+4629 6.5, 6.7 @ 63"  
stf1415 1018+7104 6.7, 7.3 @ 16.7"  
zeta 1324+5456 2.3, 4.0 @ 14.4"

## **Ursa Minor** *psa 51*

alpha 0231+8915 2.0, 9.0 @ 18.4"  
pi1 1529+8027 6.6, 7.3 @ 31"

## **Virgo** *psa 47*

stf1627 1218-0357 6.6, 6.9 @ 20.1"  
54 1314-1849 6.5, 7.2 @ 5.3"

## **Vulpecula** *psa 75*

stf2769 2111+2409 6.5, 7.5 @ 17.9"

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## **Have You Hugged An Astrologer Today?** **Stephen Saber**

How many are already cringing at the mere mention of the word *astrologer*?

It's almost a gag reflex for some of us. But then, amateur astronomers are practically bred to criticize all things astrologic, and to discourage others from following that blasphemous starpath.

I've certainly done more than my fair share of astrology-bashing (*Saber's Fractured Horoscopes* is probably still floating around the internet somewhere).

So while it is certainly not my intention to leave readers with a grudging admiration of astrology and its practitioners, I would like to share some accumulated- albeit hard to swallow- perspectives regarding them.

Astrologers used to have one of the best gigs in town. Before telescopes came along, they were considered experts in philosophy, theology, and psychology, as well as masters of the stars. But the problem with being held in such high regard was that they eventually became the scapegoats for the kings' and emperors' bad decisions. This usually meant death or exile, causing many to shy away from professional astrology as a career goal. Still, there seemed to be marked personality characteristics common to different individuals whether it had to do with the stars or not. People continued to explore this, although they would never again bet their lives on it.

Meanwhile, in attempts to explain or disprove the correlation between heavenly bodies and Earthly existence, critical stargazers were noticing discrepancies in the movement of Sol and Luna among the other points of light in the sky. Made aware of these compounding eccentricities, even kings realized that the sky's motion was no longer a viable way to plan their day- much less start a war or run an empire.

Galileo may have turned the world on its ear with his Jovian observations, but he also made it chic to discover new facts about the stars and their motions. And although astrologers had already named most of the constellations and bright stars, the newly motivated *astronomers* continued using the already familiar terms. Ironically, this shared terminology is pretty much the reason many grit their teeth at astrology. And except for the shared terminology modern astrology and astronomy are totally different animals. They just happened to have been born in the same celestial jungle.

Astrology's relation to the physical universe is purely symbolic. Horoscopes and starsigns, for example, don't allow for precession. I used to joke that the Head Astrologers were simply lazy, and content to wait 21,000 years for the silly ecliptic to realign itself. In actuality, they simply don't care. It's not even fundamental to their pursuit. Horoscopes themselves, like fortune cookies, almost always give vague but sensible, positive advice. Accuracy is only rated by how well it helps one get through their life.

Also, there is no bad publicity. Without astrology and daily horoscopes in thousands of newspapers, how much media attention would the constellations and star-stuff get? Not much except for the occasional Pluto Status Update and some new planet pics every couple of years. Maybe we should instead be thanking astrologers for their misguided but prolific advertising. The viral 'revised zodiac signs' prank by astronomers now and then also add some decent outreach mileage.

While I admire the passionate and thorough spanking Phil Platt (of *Bad Astronomy*) gives astrology, I've nevertheless conceded two practical- if peripheral- benefits of horoscopes; It's often a daily reminder of- and many people's first exposure to- astronomical terms. And the 12 classic zodiac constellations are usually at least listed in proper order. Good reinforcement for learning ones way around the ecliptic.

Realizing or wanting to realize these astronomy-based benefits is another matter.

As a veteran starparty host, I've also found that astrology fans are some of the most appreciative guests at ones scope, assuming they're not scoffed at once they reveal their own stellar connection.

Lastly, any animosity toward astrology, or anything so innocent in life, only takes up that many more brain cells that could be used to enjoy ones own pursuits and passions. Especially the stars.

And if I've offended anyone over the course of this article I apologize. Unfortunately it's in my nature. I am, after all, a Scorpio.

*Stephen Saber does not practice astrology, but defends its existence.*

*He curses the clouds from his home in Rock Island, Illinois.*

\*\*\*\*\*

## **Post Perihelion**

*Astroforum Candy*

**Stephen Saber**

### ***beyond starhopping: sharpshooting...***

Our scopes are shaped like grenade launchers and cannons. Finders give us crosshairs and bull's-eyes.

Those of us who still enjoy the theme and thrill of the hunt take pride in possessing a quick and accurate target acquisition. So I view starhopping as an initial reconnoiter, not a continuous requirement.

Sharpshooters practice what has also been referred to as 'spatial acuity'. Basically, this is memorizing simple asterisms formed by nearby visible stars and a finder's red dot (or other) reticle pattern.

Many of us reflexively form invisible asterisms on a regular basis. In light-polluted skies we fill in the dimmer stars of the Little Dipper or Corona Borealis. Sharpshooting is the DSO equivalent.

An excellent exercise is to see the red dot as the target itself. After completing an observation take another look thru the finder with both eyes open and imagine the red dot completing a simple local star pattern (a triangle, an 'L', etc.). Return the scope or binoculars to a neutral start position and aim again to recenter the target solely as the completion of a stellar pattern.

Using ones lowest power/widest field EP is recommended, as this allows a larger margin for error.

It won't happen overnight, and some are tougher than others, but with repetition this logistic reinforcement will allow the observer to eventually memorize hundreds of otherwise invisible DSO positions and skip the celestial pinball routine altogether.

Building this personal go-to database of 'lock and load' targets is both a goal and reward of proficient starhopping.

The 110 Messier objects are popular sharpshooting targets. Becoming intimate with their positions is also essential for those wishing to test their prowess while running the M-Cubed (Messier Marathon from Memory).

### ***on outreach...***

When to show certain targets can be just as important as what to view during public sessions.

If the skies are dark enough, deciding to show any galaxies or nebulae should be saved until everyone's had the time to become sufficiently dark adapted. Along that theme, fuzzies are not the best choice immediately after perusing, say, a First Quarter moon.

Also, space your biggest crowd-pleasers wisely. For example, the Pleiades or Double Cluster can be good warm-ups for, say, Venus, but try to save another jaw-dropper (M13, Saturn, Jupiter, etc.) for the end.

Keep the anticipation high by letting your group know about the treasures you will be getting to later. Passing around binoculars to those waiting is also a good idea to keep the crowd interested. Offer to let visitors take cellphone snapshots thru the eyepiece. Astroclub newsletters, IDA pamphlets, old astro mags, and Orion catalogs also make good outreach handouts.

Finally, check ahead of time for any bright satellite passes or Iridium flares that might be available.

A little planning can go a long way.

### ***on S&T's Pocket Star Atlas...***

How good is the PSA?

I have the Corona Borf Collector's edition.

Every time I open it, Izar and a few of Virgo's galaxies wink-out of the sky in compliance.

Truly a powerful atlas.

*(the first run printing had 'white holes' masking info on a few charts, one cutting-off part of CrB's name)*

### ***on deep sky objects...***

'DSO' can also stand for Dark Sky Objects.

Hunting for galaxies and nebulae without 5th magnitude stars showing can get pretty masochistic.

Seeing the entire Little Dipper asterism (or more) is a popular indicator of galaxy-class skies.

Traveling even 20 minutes farther from city lights, catching your targets as high as possible above the horizon, and a good dose of dark adaptation can also make a big difference in detection/detail.

Aperture rules, but only if dark skies and transparency allow it to.

90mms from the boonies can easily outperform much larger scopes from suburbia on many DSOs.

### ***the keystone express...***

To catch M13 on the rise; Follow a line from Arcturus thru Alphecca to the SW corner of the Keystone (zetaHer).

The Hercules Cluster lies 5° north.

### ***darksky arenas...***



I'm going to have some Superdome-sized Bortle Black planetariums built with a projection accuracy to match. Really, really accurate. Open 24/7.

Peaceful outdoors sounds. Always a clear sky waiting. No more frozen fingers. No skeeters. Lunatic Happy Hours. Southern Sky Sundays and Messier Marathon Mondays.

Such an idea might offend a lot of hardcore purists. Many might come just for the experience. But I really can't see also faking the observation making any difference to goto users. \*sorry. old habits.\*

Or maybe night sky colloseums. Huge fields with perimeter walls rising to block local light pollution and outlying city lightdomes.

Would you come?

How far would you drive?

How much rain and cloudcover would it take?

Will preserving an area's dark skies eventually come to this?

### ***soccer field solar system...***

One could roughly relate the Solar system's size by comparing Jupiter to a soccer ball placed just shy of a mile away.

Pluto would be a 1/8" pebble at a distance of 6.5 miles.

Earth would be marble about 7/8" inch in diameter at 300 yds.

Sol would be a rather warm sphere 9 feet in diameter held above your head.

### ***bent on the coathanger...***

Our ancient friend Al-Sufi notes this stellar collection in 964 B.C. But aside from receiving a moniker from D. F. Brocchi in the 1920s, this 3.5 magnitude gathering somehow manages to avoid being 'officially' catalogued for the better part of three millennia, ending-up as Per Collinder's 399th entry.

We often wonder about the many obvious targets that Chuck Messier skipped. But the cold shoulder shown toward Collinder (Cr) 399 takes the cake.

It practically begs for attention, sitting three and a half degrees northwest of alphaSagitta and covering over a degree of celestial realty within the great Summer Triangle.

Adding to its interest, the jury is still out regarding 399's status as partial open cluster or chance asterism.

But Messier didn't want it. The Herschels didn't want it. Doesn't even rate an entry in the NGC or IC. It doesn't make the RASC's Finest list or the Caldwells.

Almost as an afterthought, this blatant naked-eye staple finally lands a discreet place in the A.L.'s Deep Sky Binocular list. (By unfortunate coincidence- mostly alphabetical- it also ends up the last entry of the *Concordiem.*)

Even the diminutive 9th mag open cluster ngc6802 at the Coathanger's eastern edge often gets more publicity.

My point? None really.

Just that any binocular or low-power telescopic view of this Vulpeculan treasure is sure to drive the above irony home.

As a side note, the man who invented the wire coathanger never saw a dime. The company he worked for grabbed the idea and patented it in 1903.

### ***speaking of cr 399...***

Two blondes were in a parking lot trying to unlock the door of their Mercedes with a coat hanger. They tried and tried to get the door open but they couldn't. The girl with the coat hanger stopped for a moment to catch her breath and her friend said anxiously, "Hurry up! It's starting to rain and the top's down."

### ***observer levels: how do you define intermediate..?***

Has not completed the H400 but consistently spells 'aperture' correctly.

***my first first light...***

A neighbor's borrowed 70mm refractor from a nearby graveyard (also my first darksky expedition). Eventually I found Saturn.

It must've been enough.

A week later I owned a 16x80 bino and 8" SCT loaded for bear.

***fair warning...***

Without knocking goto (just this once), but as a reality check to beginners interested in this feature with their first telescope, I've included the instruction manual link for the ETX90's optional AutoStar GoTo controller (about as easy as it gets).

There's a little more to it than pushing a 'Jupiter' button and looking in the eyepiece:

<http://www.meade.com/manuals/autostar/index.html>

***astro-anagrams (v2.0)...***

First, rearrange the word or phrase to spell our brighter stars' names.

Example: IN LLAMA- ALNILAM

APE CALL- \_\_\_\_\_ ( ) \_\_\_\_\_

SOUP CAN- \_\_\_\_\_ ( ) \_\_\_\_\_

ALSO RIP- \_ ( ) \_\_\_\_\_

ACTORS- \_\_\_\_ ( ) \_\_\_\_\_

COY PORN- \_\_\_\_\_ ( ) \_\_\_\_\_

A RANCHER- \_\_\_\_\_ ( ) \_\_\_\_\_

TAN EARS- ( ) \_\_\_\_\_

BEE GEE LUST- ( ) \_\_\_\_\_

A BRAND ALE- \_\_\_\_\_ ( ) \_\_\_\_\_

OX PULL- \_ ( ) \_\_\_\_\_

LUG USER- \_\_ ( ) \_\_\_\_\_

A TRIAL- ( ) \_\_\_\_\_

HAT OIL- \_\_ ( ) \_\_\_\_\_

TRIBAL LEX- \_ ( ) \_\_\_\_\_

ZETA RALPH- \_\_\_\_\_ ( ) \_\_\_\_\_

Solar system object:

DEAR OTIS, I ROASTED, DO EAT SIR, ROAD SITE, DORIS

ATE, RADIO SET, IRATE DOS, DO I STARE- \_\_\_\_ ( ) \_\_\_\_\_

Now rearrange the circled letters to reveal the mystery Messier object (Hint: 3 words).

Good luck...

***scopes or binos...***

Both have their advantages and should be thought of as complementary instruments for enjoying the stars, i.e. binos and their wide field for the forest perspective, and scopes for their power to peruse the trees. Every new magnification and FOV has its own resolution and aesthetic reward.

### ***on astro-forums...***

\*with apologies to *Cheers*\*

Sometimes you want to go  
Where everybody feels your pain  
And the rants are all the same  
You wanna hunt some DSOs  
But the weather's gone down the drain  
You wanna go where everybody feels your pain.

### ***online chart errors...***

\*more apologies to *Car 54*\*

There's a typo in the Queen  
Bootes borders gone awry  
There's some nebulae in Cygnus  
That belong in Gemini  
There's no Sagittarius  
Leo's labelled 'Pegasus'  
M54, where are you?

Sorry. Bedtime.

### ***telling castor from pollux...***

Pollux is the brighter one (lux).  
Also sounds like Pollen, and is closer to the Beehive (m44).

#### *less intuitive hints:*

Castor is the farther one (49 vs 34 ly).  
Castor is the one without a planet.  
Castor is the mortal one (twin).  
Castor precedes Pollux alphabetically and by right ascension  
(by about 10 minutes).  
Castor is an A-class star which alphabetically  
precedes Pollux's K-class.

### ***outreach or outreach...***

During public starparties or other non-academic events, which approach do you use with guests?

Tour Guide? Expert? Both? Neither?

My goal is to relay accessibility. Modus operandi: If I can do this, anyone can. I'm an enthusiastic novice who just received a binocular/scope and a map of the stars last Xmas. Keep the unfamiliar astro-terminology to a minimum. Just a stargazer that enjoys sharing views of the night sky treasures.

A broader outreach agenda deals with allowing people to enjoy the night sky on their own terms. The next neophyte looking thru my scope may want to become a professional astronomer, or maybe they just like the pretty colors. They might use a different preferred object identifier or constellation pronunciation than me. I'm not there to judge or enforce some personal 'policy' (although this can often require biting ones tongue- a skill

lost on a small but vocal number of amateurs- rather than alienating newcomers). True outreach is given without qualification. My top objective is that they enjoy the show and keep looking up. The public often has the preconception of astronomy enthusiasts as being condescending, pedantic, and overtly scientific. Try not to give them any reason to confirm it.

### ***the great square of leo...***

I really enjoyed Saturn's trip thru the stars of Leo.

On entry in early 2007 our Lion appeared to be fondly batting at the ringed planet like a hanging playtoy. Along with epsilon Leo, Algeiba, and Regulus, Saturn completed a very colorful Great Square. It was a leisurely trek to the stars of Virgo, but Saturn won't be visiting Leo again until late in 2035.

### ***once in a black moon...***

That's the wiccan term for the 2nd New Moon in a month anyway.

Works for me.

Other monikers include; Dark Moon, Secret Moon, Finder's Moon, Spinner Moon.

### ***a groovy moon...***

I've found images of a Full Moon in Venus' Belt, but not one with Luna directly 'on the border'.

That's what I caught tonight.

A multicolored, oversized beachball 3° above the NE horizon.

Our low-contrast orange, cream, and light-blue moon blended with the sky to the point of appearing to be a mirage.

It only took a few minutes for Sol's increasing glare to extinguish the tie-dyed effect, but it was the most psychedelic 99.9% phase I've seen.

Perfect bead/crescent hunting horizon, too.

### ***back to luna...***

I don't like the idea of digging and drilling into our moon. Or eventually having explosives there.

Earth is a very resilient planet.

Luna is a low-density, dusty rock.

Ever accidentally tap something solid at just the right point that it splits instead?

### ***our temporal-mental moon...***

That ashen light takes an extra bounce to reach us.

So we're also viewing two separate temporal light reflections from Luna.

Sadly, we can only enjoy Earthshine as it appeared 2.6 seconds ago.

During Earthshine, shouldn't there be an area of illumination where a transiting object of specific size, velocity, and distance (and/or its shadow) would appear to skip (or lag) across our moon?

Now that would be a wild observation.

The time-delayed terminator also translates to a constant observed surface phase delay.

I got about 15 feet/5 meters at the equator.

Maybe 70% of that at mid-lats.

Anyone else feel ripped-off?

### ***sliver spotting tips...***

Set up at a site with as much altitude as possible overlooking an unobstructed horizon.

Optimal sky transparency allows the crescent to be detected and tracked down to, or up from, the horizon.

Using a telescope or binoculars (mounted binos are recommended), fine tune the focus on Venus, Jupiter, or one of the brighter stars beforehand.

For dusk attempts, have Sol's setting azimuth on hand- making note after sunset of a random landmark at that position for reference- as well as Luna's altaz position at sunset thru moonset. Accordingly, for dawn attempts, have Luna's altaz info for moonrise thru sunrise.

As dawn slivers have the advantage of possible detection with dark-adapted eyes, wearing sunglasses during the day prior to sunset attempts is recommended for maximum 'dusk' adaptation.

Once the crescent is acquired in binoculars, walk the bino down to the horizon/random landmark in consecutive FOVs for the approximate naked-eye altaz.

A favorable elongation (aka 'moonlag') is important. In the 24 hours before or after New Moon, Luna's angular separation from Sol can vary by several degrees. With a favorable ecliptic, net elongations (as altitude) of 5° or more at sunset or moonrise offer the best window for detection. 8-10° is necessary to catch Saber's Beads in optimal/deep twilight.

Slivers near perigee help present a thicker and brighter lunar profile for personal record crescent spotting. Illuminated fractions of same-age crescents within 24 hours of New Moon can vary by 200% and a full magnitude of brightness.

Last but not least, don't always count-out a shallow ecliptic. Occasionally our moon's extreme northern or southern declination will compensate for a less than favorable ecliptic angle.

### ***the other moon illusion...***

The shadowplay along our moon's surface often coaxes our depth perception to transform sloping craters into bulging domes (aka the convex/concave con).

Some people think they're hallucinating.

Others never see it.

I practice inverting them at will.

A related Solar illusion known as the Wilson effect gives a depth perspective to sunspots as they approach the limb.

### ***memoirs of a giant bino junkie...***

Just kidding. But I should write a book about it someday.

My first serious glass was a 16×80 binocular.

I keep several Armored and on display.

I'm still compelled to audition any Giants with my preferred specs.

### ***saber's reform of met-error-ology...***

1. Scrolling tickers reading 'For Entertainment Purposes Only' required during forecasts.
2. Local LVMs, Transparency, and Seeing conditions will be diligently measured and reported.
3. The phrase 'Fair Skies' will be replaced with 'Roll the Dice'.
4. Meteorologists will be paid on commission alone.
5. Forecasts beyond 2 days will now be limited to two words: 'Mostly Seasonal'.

### ***out-of-context response to a bino query...***

Leery as well. Bullwinkle only has 6 rounded tines. For a hundred bucks, I'd be content if it arrived collimated and without any mechanical defects. Btw, Tycho Brahe had a pet moose that once got drunk and fell down the stairs in his castle. Seriously.

### ***outreach: adopt-a-star...***

I used to buy novelty stars like candy as 'dozen-roses-alternative' gifts. (This was before any contribution-worthy Adopt-A-Star programs existed).

The International Star Registry even offered me their Cluster Club Visa.

One night, I decided to go out and hunt one of those stars down. I haven't went a day without Looking Up since.

Adopting these stellar gifts could even be considered a form of Outreach.

All it took was one obscure sun in Perseus (besides running into the Alpha Persei and Double Clusters along the way) to trigger my obsession.

Btw, I'm still stuck with a star in Ursa Minor's bowl from a breakup before the certificate arrived.

A shame, being as it's in such prime celestial real estate.

Years later, I'm still looking for another qualifying recipient hottie with the initials TLS.

Until then, the 11th magnitude sun just goes by 'Tough Luck, Saber'.

For a small fee, adopting a star thru a local astronomy club not only benefits a good cause, but just might help spark a lifetime of fascination with the night sky.

('TLS' aka 10.8 mag TYC4417-00335-1 can be visited at radec 1506+7420)

### ***a mane attraction...***

There's a beautiful parade of 7th and 8th magnitude stars winding south and east from etaTau in the Pleiades. I imagine this stellar chain as Ally's Braid (the flowing locks of Lady Alcyone).

### ***little joe (from kokomo)...***

This colorful 'four the hard way' naked eye asterism lies just southeast of the pisces circlet at nearly the zero radec nexus (27, 29, 30, and 33psc; psa 07). Also my nod to the nasa rocket series of the same nick, the quartet makes an equally convincing piece of 'chicklet' gum. The ecliptic runs directly between little joe and the circlet.

### ***dreamcatcher...***

A wreath of 5th-7th mag stars loosely surround gammaCygnus (Sadr). Nebulosity in darker skies thickens the 2° ring and enhances the void between. Best in 15-20x binos. (2023+4017 psa 62)

### ***the planetarium tour story...***

Okay, picture an insolent and gung-ho (not mellow like now) neo-amateur Saber on a 30-person tour of a certain large and famous planetarium. The condescending tour guide is a 3rd grade science teacher on summer break.

During the Solar system slide show an unmistakable photo of our moon is shown. The guide non-rhetorically asks, "Who knows what this is?"

A man sitting a few chairs away from me happily states, "It's the Moon!"- and gets chastized by the pedantic guide; "No. It's just A moon. There are x-number of moons in the Solar system! Ours is called Luna!"

It was very rude, and the admonished man looked like he was going to cry.

A few more slides and scoldings go by.  
The crowd is not having a good time.  
Then an unmistakable slide of a very close star appears.  
The guide begins his rote commentary; “Here’s the Sun showing quite a few sunspo...”.  
I’d had about enough of this joker.  
“What?!”, I scoffed loudly. “The Sun?! There are billions of suns up there! Ours is called Sol!”  
He was speechless as the entire audience and onlooking staff began laughing and applauding.  
The deflated guide finally managed to utter the word, “Touche’ “.   
His commentaries remained carefully generic and pleasant for the rest of the tour.

*[note: planetarium mentioned is not the Adler. Chicago’s Adler planetarium is the Disneyland of stargazing and you should go this weekend if possible.]*

***you must become one with the ecliptic, grasshopper...***

Ecliptic Grasshopper.  
Sounds like a mixed drink.

Ever want to memorize the Great Lakes?  
Just imagine beautiful **homes** along the shoreline:

**H**uron  
**O**ntario  
**M**ichigan  
**E**rie  
**S**uperior

How about one for the number of chapters in the Old and New Testaments?

Old: 39  
New: 3×9 (27)

Here’s an easy mnemonic for the classic zodiac constellation order.  
It might save your life someday (or at least come in handy in the field).

Cats Are Pets, And The Good Cats Live Very Long Some Say

[Capricornus, Aquarius, Pisces, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpius, Sagittarius.]  
The word order can also be transposed and tweaked to start at (the first point of) Aries.

***most impressive observations...***

- #5 First Luna/Saturn Occultation
- #4 First Experience with the Southern Skies (LMC, SMC, Eta Carinae, et al).
- #3 First Experience with real (Arizona’s 7+ mag) skies. Quite an eye-opener for those from the mediocre, light-polluted Midwest.
- #2 Feb. ’98 Total Eclipse (Aruba). Jupiter and Mercury poised as vanguards on either side of Totality.
- #1 The Millenium-class Finger of God: Hyakutake

Honorable Mention:  
Venus transits Sol (’04 and ’12)  
Revisiting everything thru my first set of Naglers

***on first trips to dark skies...***

Darksy fever can be just as addicting as aperture fever.

First it's a 20 minute drive, then an hour. Next thing you know, you're in the mountains of Colorado and Wyoming.

Unfortunately, it just makes coming back home that much harder.

After my first trip to Arizona, I was kicking and screaming as they dragged me back into the 727.

### ***doublevision...***

The appeal of doublestars? If you have to ask you'll never understand.

It's about uncovering a star's secrets; companions, colors, and personality.

Personally, I prefer the opticals as they are unique to our perspective from Earth. Binaries, OTOH, can't *help* but be doubles.

Illusion or not, one of the liberties of Double Star observing is that there are no 'wrong' apparent color interpretations.

I'm also not a fan of knowing the PAs ahead of time.

Kind of a plot spoiler, and can lead to false positive IDs.

Estimating mag/sep between oncoming headlights and noting the color variation in rows of traffic lights are common signs of DS addiction.

### ***sharpshooting m81...***

4.6 mag 24UMa is my m81/82 guidestar, just 2° west of the pair. Chances of nokking these fuzzies literally do not bode well unless this sun is visible naked eye.

The two galaxies also make a large but nearly equilateral triangle with alpha and upsilonUMa.

The Phecda/Dubhe route works best if the line continues over the top (just north) of Dubhe.

### ***on opposition...***

Definition #2: Approaching an unsympathetic spouse about any astro-purchase.

### ***on stress-free stargazing...***

I stopped watching/reading the weather forecasts years ago. My horoscopes have a better track record. I just look out a window. If it's clear, I'm there. Out of state excursions have an exactly 51% chance of decent skies. DSO junkies are well advised to come to terms with Lady Luna. You don't have to embrace her- just tolerate her. Remember- stress is bad for your eyes.

Also, reminding myself that starry nights are a privilege, not a right.

### ***sol is not a four-letter word...***

Since the discovery of other suns and moons those terms have become common nouns, so I've always been more comfortable with the clarity of referring to our sun and moon by the proper names Sol and Luna. Besides, it's the Solar system and Lunar eclipse, not Sunar and Moonar. With most every feature named from their greek/arabic roots, why balk at the main indentifiers? Also, as one fellow observer noted, "Sol and Luna also sound more scientific". Following this, there are no other Solar systems. It is the celestial neighborhood unique to our star. Solar-type or Sol-type systems has a better semantic ring to me for similar suns with orbiting planets. 'Sun-like stars' always sounds redundant and silly to me as well. Kinda like Canine-like dogs. On the even lighter side, the term 'The Sun' might not come across as very PC in the future...

Imagine one of the neighboring gangs of ETs get lost and land on Earth to get directions. The Head Alien gestures at Sol and asks the name of the star in our system. Joe Astronomer puffs-up his chest and replies, "That is The Sun!", to which the Aliens all fall on the ground laughing, "The Sun?! Sun, Schmun! You call that a sun? Our sun could engulf this and two other star



systems and then go home and chop firewood. Pathetic earthlings. Because of your arrogance we will assimilate you first!" I'd hate to think that after all this time preparing for contact with other life forms that we would be assimilated on the grounds of mere semantics.

### *nice night for an eclipse...*

Cold but nice, anyway.

I volunteered the services of my 102Mak and 20×80 to assist the local college planetarium's lunar eclipse presentation.

Some 200 hearty souls braved single digit temps and a soft but biting breeze for the event. Interestingly, my GLP seemed to generate as much excitement as our rare celestial alignment.

After the crowd thinned out I plugged my binoviewer into the zerbatory's formidable C14 for one of my most satisfying views of Saturn to date.

I hadn't been jawdrop wowed at a scope for awhile- and it felt good.

After clearing our shadow Luna even managed a beautiful 22° halo as an encore.

Recharged and rejuvenated,  
Saber

The Deere planetarium at Augustana College (Rock Island, IL):  
[helios.augustana.edu/astronomy/](http://helios.augustana.edu/astronomy/)

### *public forgiveness...*

*"I was born in February, so I'm an Aquarium." -Kelly Bundy*

So I'm hanging-out with a girl I recently met and her birth date came up.

I correctly guessed 'Gemini' (having memorized the precession-impaired astrological zodiac) and, ever the romantic, asked if she'd ever seen 'her' constellation.

I got a blank smile.

Me: "You know. The stars of Gemini... In the sky?"

Her: Blank (but pretty) smile. Then, "I just know I'm a Gemini."

I'll be saving this particular Outreach venture until I get a free decade.

In fact, after a string of unsupportive card-carrying GASH\* members, indifference is a gift.

*\*Girlfriends Against Stellar Happenings*

How bout the 'Public Full Moon'?

How much leeway do you allow them to call it 'Full'?

I don't start biting my tongue unless they're a good day and a half off either way.

Otherwise I just nod and let them enjoy it without comment.

But it takes a conscious effort.

check out the caption:

<http://www.shutterstock.com/pic-2100483.html>

perseverance:

<http://www.shutterstock.com/pic-2100477.html>

fortunately he's got another gig to fall back on:

<http://www.shutterstock.com/pic-2119725.html>

success!...doh. cept' for the dustcap:

<http://www.shutterstock.com/pic-2100476.html>

### ***conjunction junction...***

(10dec2006 0530-0700cst)

Telescopically teased and taunted early by our moon- sliding a mere 34' north of Saturn. After appreciating the close reunion of Mercury, Jupiter, and Mars thru binos, the trio all eventually squeezed their way into my Mak's 1.3° field of view. The severe low-altitude turbulence only allowed the three spheres to dance in rainbows of scintillation. BetaSco also joined the conjunction from a distance of over 500 light-years. The near-occultation and rare planetary gathering made for a very memorable double-feature. I'd also like to thank Ma Nature for looking the other way this weekend. Great celestial fix.

### ***sgh400: the case of the missing green triangles...***

Reasons the targets themselves are not denoted on the charts:

To avoid clutter.

They're unnecessary (the project can be completed with the guide in stand-alone mode).

Only the visible stars are intended to be shown.

I was also not aware of how dependent some observers are on those symbols, but will try to fit them in for the epoch 2050.0 edition.

Thank you for your patience.

*\*update: due to impractical printing/ mailing costs, the sgh400 is no longer in publication. i recommend its polished successor, the herschel 400 observing guide from cambridge university publishing.\**

### ***olive, the other nebula...***

Found a DSS suprise while browsing M35's neighborhood.

I've seen my share of plate noise, but this guy was pretty impressive.

Its cause is either the dec entry error or I've unlocked a dimensional phase-shifted deep sky code.

Definitely some symmetrical phillips-head mottling.

Olive's plate noise catalogue parameters are

ra 06 06 20.0 dec 24 10 000 plate 60'x60'

P0SS2/UKSTU Red, HST Phase 2 (GSC2)

[tinyurl.com/8nolxk](http://tinyurl.com/8nolxk)

happy holidays!

### ***a foxy hat trick...***

Vulpecula's Coathanger completes a nice 8 deg equilateral triangle with Albireo and the Dumbell Nebula.

Great trio of targets for public star parties.

### ***got rhodopsin...?***

After being under beautiful dark skies for a few hours, one might take a break from the eyepiece and notice that the sky and especially the surroundings look brighter. The LVM hasn't dropped, but the black just isn't so black anymore.

Even those 7+ mag skies that begin as \*pitch-black\* lose their aesthetic contrast after hours of dark adaptation. But our eyes are only doing what they're supposed to. The rods are in overdrive and the cones are doing their best to catch up.

The ability to read and walk safely by the Milky Way's skyglow alone is a common sign of 'hyper-adaptation'. Personally, I miss the contrast. Not to the point where I'd intentionally ruin my galaxy eyes with an artificial light source... but I miss it.

### ***ecliptic delinquency...***

In addition to the 12 zodiacal constellations, Luna and the visible planets can also appear within the borders of Auriga, Ophiuchus, Cetus, Orion, Corvus, Sextans, Canis Minor, Pegasus, Crater, Scutum, Hydra, and Serpens. (Pluto can cover the real estate of an additional 17 constellations.)

### ***beads and smoke rings...***

Along the centerline of an eclipse, the 'beads' aspect of our sun and moon's limb being so properly aligned can be so short-lived as to escape notice. The full necklace of Saber's beads could be thought of as this moment frozen in time (and enjoyable with much less risk to our eyesight).

But while viewing these older waxing and waning phases, zero in on those stray limb beads at high power and slowly defocus them. The diffraction rings from the sunlit peaks against the terminator intertwine with the smoke colored links- transforming Saber's beads into Saber's *chain*.

In heavy turbulence the chain takes on a multicolored neon appearance.

Like Mardi Gras- the more beads, the better.

### ***inside saber's beads...***

It is both a lunar aspect phenomenon and informal term for the detached points of illumination at the tips of thicker crescents. Those within and near libration zones would also all be considered potential precursors to the complete effect, so I only claim to have inherited and upgraded the status of those stray tip beads.

It started out as a fun outreach term and an offering to pay it forward to an obsession that has given me so much.

When I'm not immersed in observational astronomy I destroy drumkits. Personally, this made the bestowed term especially apt as the tips of drumsticks are also known as 'beads'.

While I made no attempt to share or spread the term online until both *Astronomy* magazine and the Astronomical League had endorsed it for promotion and study, the term at its inception nevertheless drew a small cry from vandals and trolls. As usual, this came from those least qualified to offer an opinion. But I quite enjoyed and welcomed the controversy. In fact, one could not have paid for such effective publicity. All photo examples were used with permission and those strictly not for profit.

By 2010 the term had taken on a viral life of its own, appearing in literary fiction and crossword puzzles, and was found related to crafts, decorations, and even the transcendental (representing open-mindedness and increased perspective i.e., experiencing a *Saber's beads* moment). Australian composer/pianist Sophie Hutchings released the track 'Saber's Beads' on her 2012 album and at YouTube. This was all also welcomed and I'm pleased that the phenomenon's interest was not limited to the world of astronomy.

### ***and at 2 days it's called diana's thong...***

To the Romans she was Diana, the Goddess of the Moon and of the Hunt, but has many names in many cultures worldwide. By whatever name (Isis, Ishtar, Artemis, Bridget, Ngami), she hunted with a silver bow and shot arrows of moonlight. Luna's 3-day-old crescent is said to be shaped like her Bow.

It's also a wiccan reference. Diana's Bow is important to witches for its magical forces.

At the opposite phase (3 days before New) Luna forms a 'C' and is sometimes referred to as Hecate's Sickle (Hecate is another possibly not-so-pleasant moon goddess). The sickle is an ancient image which relates to harvesting and death.

Nothing morbid intended- just googled this stuff up.

### ***virtual observing: sitting in plato...***

Wanna hear something scary?

I think I've spent more than enough time watching Earth from our moon using *Celestia*. Now when I've got Plato in my sights the view back at us is conjured nearly simultaneously.

### ***observing clubs we'd really like to see...***

#### **THE CRYOGENIC DEEP-SKY CLUB**

Participants must observe any 100 NGC objects during the months of December and January in temperatures not exceeding -5 F (wind chill optional). At least 25 of these observations must be made with no sensation or feeling in your fingers or face.

Projects also include making snowangels with your Dob and sketching a friend's tongue frozen to your optical tube. In case of lethal frostbite, pin a note to your chest instructing paramedics not to revive you with paddles; remembering that electronic aid is not allowed.

#### **THE ANT-BURNERS CLUB**

Amaze neighborhood children with the true destructive powers of your scope. Requirements include partially, annularly, and totally frying 50 insects with your finder scope. At least 10 of these should be from the arachnid order. Sketches should be made in gory detail and include smoke plumes. Note the elapsed time, aroma, and Solar angle of all annihilations.

#### **THE AMAZING STORIES CLUB**

The list of audacious visual claims is endless. To qualify for this certificate you must visit a minimum of ten starparties and collect the top 3 Amazing Stories from each. Note the date, time, sky conditions, and expressions of disbelief from those listening.

Don't leave the party without interjecting your own fantasy observations, each time adding a couple tenths of magnitude to your LVMs.

#### **THE GO-TO CLUB**

No observations required. Participants need only mail the purchase receipt of their Go-To scope or accessory to the program coordinator to receive this certificate. Congratulations! You can now proudly show everyone that you have no idea how to aim a scope. Projects for those wishing to receive the additional commemorative pin include breathing, shooting fish in a barrel, and walking on the Earth's surface.

#### **THE IDA VIGILANTE CLUB**

Using rocks, slingshots, or automatic weapons, amateurs are encouraged to extinguish a minimum of 25 pesky streetlights in their neighborhood. With each conquest, make sure to note the location, time, weapon of choice, and police activity in your area.

A commemorative pin is also available for those eliminating 100 or more stray light sources or an entire Wal-Mart parking lot.

If arrested, hold strong to your belief that you were only acting in self-defense against the harmful, misdirected photons.

### ***wtf was that...***

I caught my first fluke Iridium in the summer of '97 (shortly after their original launches).

I spent days pondering what that bizarre -5 mag brightening that blazed thru the Little Dipper's bowl was before finally hearing of their existence and apparition potential.

The *explosion's* sketch is still penciled in on Map 2 of my old SA2000.

### ***fess up, iridium junkies...***

How many have actually traveled to a flare center?

I've gone after brighter than -7s that were en route to my darksky sites and planned local outreach events around some impressive flares just to wow the public. Good stuff.

### ***those extra galilean moons...***

Io, Europa, Ganymede, and Callisto are all brighter than 6th magnitude and easy detections in most any binocular. (Often, one or more will be passing in front of or behind Jupiter's disc.) In fact, each moon would readily be visible from a dark sky without any magnification if not for the tremendous glare of the gas giant. Every so often a brighter field star or two will attempt to sneak into the Galilean plane, but Jove soon gets annoyed and kicks these occasional stellar imposters out of the litter. During the last days of June 2008 this '5th moon' is played by a 5.6 mag background star in Sagittarius. Also known as HR 7327, the class A5/FK blue-white sun resides at a distance of just over 191 lightyears.

So while we're admiring our neighbor Jupiter during this close conjunction, it may be interesting to note that; Charles Messier was 85 years old, the bicycle was invented, and Mississippi was admitted to the union as the 20th state when that light from distant HR 7327 began its journey toward us.

### ***or, those extra galilean moons...***

Occasionally a fieldstar or two can be seen posing as Galilean moons. Jupiter even occults a few of these stars. Ideally each Galilean would also get a shot at blocking these suns, and the entire system pass would take place at a favorable elongation from Sol.

Cruising around with my astro software found such an event scheduled around Jove's occultation of 7.9 mag SAO 187846 coming up on July 12. During the main system pass each of the big moons threaten the fieldstar, the closest conjunction made by Callisto as a finale. The star also closely rides Callisto's orbital rail for the duration.

The dynamics of the pass will be especially compelling; Io and Europa appear to chase the scurrying sun right into the hands of Ganymede and Callisto before it narrowly escapes to points east.

(Sorry. I've been in cyberspace all night.)

Anyway, this all starts on July 11th 2008 in north-central Sagittarius just SE of the Teaspoon asterism (psa 67). The unsuspecting star can be found at radecc 1914-2234.

### ***resolving the galilean moons...***

Ganymede's diameter can swell to over 1.8", which puts its disc resolution in the 60-70mm range. Near opposition the discs of Io and Europa are good tests for 90-100mm scopes.

### ***messier's sweet sixteen...***

Here's an easy galaxy-hop thru sixteen of Messier's finest non-comets in the Virgo/Coma cluster. Choose an eyepiece that provides as close as possible to a 1° field. The trail begins at our Lion's tail.

[SA2000 14, PSA 45]

From Denebola (betaLeo), go 0.3° (fields) N and 6.8° E to star 6Com.

From 6Com go 0.5° W to M98.

From M98 go 0.5° S and 1.2° E to M99.

From M99 go 1.0° E and 1.4° N to M100.

From M100 go 0.6° E and 2.4° N to M85.

From M85 go 5.3° S to M84.

From M84 look 0.1° N and 0.3° E for M86.

From M86 go 0.6° S and 1.1° E to M87.  
From M87 go 0.2° E and 2.0° N to M88.  
From M88 go 0.1° N and 0.8° E to M91.  
From M91 go 0.4° E and 1.3° S to M90.  
From M90 go 0.3° W and 0.7° S to M89.  
From M89 go 0.5° E and 0.8° S to M58.  
From M58 go 0.2° S and 1.1° E to M59  
From M59 look 0.1° S and 0.4° E for M60.  
From M60 go 3.4° W and 3.5° S to M49.  
From M49 go 2.0° W and 3.5° S to M61.

Don't forget to reward yourself with M104, 3.6° south of 4.8mag chiVir.

### ***drive to succeed...***

'DSO' can also stand for Dark Sky Objects.

Hunting for galaxies and nebulae without 5th magnitude stars showing can get pretty masochistic.

Seeing the entire Little Dipper asterism (or more) is a popular indicator of galaxy-class skies.

Traveling even 20 minutes farther from city lights, catching your targets as high as possible above the horizon, and a good dose of dark adaptation can also make the difference between detection and detail.

You know you're under truly dark and transparent skies when even the Little Dipper's background actually looks like it's part of the Milky Way.

Which it is.

### ***breadcrumbs to m101...***

In moderately light polluted skies, crosschecking m101 as the top vertex of a slightly flattened triangle with Mizar and Alkaid, four 4th and 5th mag stars east of Mizar can be used as a trail of breadcrumbs to this often shy fuzzy. 101 is only another degree and a half northeast of the 4th crumb, 86 uma.

### ***be prepared...***

Consumed with hunting Herschels several Januarys ago, I didn't even realize it was -16°F until I heard it on the radio driving home.

But the coldest I ever *felt* while observing actually happened one August.

Laramie, WY was enjoying a warm 85 degree summer day.

That night however, I froze my aperture off at 14,000ft in the neighboring Medicine Bow mountains, nearly paralyzed by temps dipping only into the mid-20s.

Flatlander lesson quickly learned;

Dress for temps 30 deg colder when going out observing.

Prepare for temps 60 deg colder when going *up* observing.

Plenty of fuel in in the furnace is also an essential for cold weather observing.

Load up on pizza, tacos, monster burgers with 4-digit calorie counts, etc. For sessions over an hour I also bring Snickers Marathon Bars and hot chocolate (Mountain Dew in the summer).

I've even kept my warm vehicle idling nearby- but not too close, allowing myself 10-15 minutes per hour to defrost (cover or disconnect the dome light beforehand).

As engrossed in observing as we become, make sure to get up and stretch or take a short walk at least every hour. Keeping the blood and oxygen pumping also increases eye/brain performance at the eyepiece.

### ***and it transits with spica...***

I've had some great views of Omega Centauri from points south, but from home it barely claws itself more than a degree above my hopeless horizon.

Still, every spring I find myself driven to scan the deck below Iota Cen in hopes of sighting OC's telltale glow.

Honorific starhopping?

Good practice, anyway.

### *'knowing' the constellations...*

In the end, one only needs to know the constellations well enough to enjoy them.

But if there were an absolute (short of biblical) to knowing the constellations it would certainly include recognition and logistics beyond our '2-D' skydome stuck at 1 au from Sol. That is, to be able to navigate the bright stars and swing through the radec monkeybars from all points of (starting small) the Milky Way as our familiar asterisms distort and NGC targets are regularly found grazing in alien constellations. (Unfortunately, our primitive early-21st century planetaria only allows simple and approximate virtual touring.)

In this sense, even the most symbiotic Earthbound knowledge of the stars and constellations is just the first word in a very thick celestial novel.

### *h400/h2 phantoms...*

Yes, both lists contain a small number of apparently non-existent and/or questionable targets. These are not 'mistakes' but rather intentionally included to 1) drive us to temporary insanity, and 2) experience Herschel's observation (He claimed to see something here. What will we see?).

Loathe to ruin the adventure for anyone, I'll pass on listing the specific suspects.

### *the daytime planet hunting story...*

Sometimes you get the gas giant, and sometimes the gas giant gets you.

One afternoon several years ago, my mounted 16×80 and I pegged Jupiter under a very blue sky. I only had the altaz position to go by, but the ghostly gas giant popped into the field on my first swing. I knew this was a gift- and my dumb luck was about to run out.

The next afternoon I was ready to show off my daytime hunting skills at the EISP. Jupiter had other plans. I spent twenty minutes searching and begging for that pale ghost to reappear. I was convinced that Jove had taken the day off to visit another star system.

Incredulous and with eyeballs bleeding, I got some food and went for a short walk around the park.

Fifteen minutes later I walked back over to my bino to find that Jupiter had already posed itself dead-center in the field. A 3.5 degree field. It was bizarre.

It somehow even appeared to be laughing at me.

### *on minor planets...*

Hunting and tracking asteroids does have its own appeal.

There are many available on any given night, over a hundred are detectable with moderate aperture, they holdup well against light pollution, and their rapid movement can often even be noticed over the course of an hour.

Occasional stellar grazes and occultations are pretty interesting as well.

Good stuff for those 'what else could I look for' nights, too.

### *sol at 650au...*

...still shines at the magnitude of a full moon (-12.7) with an apparent diameter of 3". its light would also always be 3.8 light-days old.

the encircling oval represents neptune's orbit.

<http://tinyurl.com/2v6g4e2>

### ***jove at lunar distance...***

celestia gives an 18° angular sky displacement at 384400km.  
At this distance io can swing within 32000km of earth and cover 6° of sky.

<http://tinyurl.com/2ftooyc>

### ***hail to the king...***

a pair of double sat/shadow transits mark the 401st anniversary of galileo's first jovian observations (jan2011):

<http://tinyurl.com/dst-jan10>

<http://tinyurl.com/dst-jan17>

### ***attack formation: bravo...***

maximum orbital tilts of the Jovian moons occur every 6 years (2006, 2012, 2018, etc.) as they cross their minimum tilts over the same period (2009, 2015, 2021).

<http://tinyurl.com/33zsajq> (jun2006)

### ***a galilean double-double...***

<http://tinyurl.com/2ce5sth> (oct2008)

### ***titan clips saturn's shadow...***

<http://tinyurl.com/2dydpqr> (jan2009)

### ***titan's shadow transits ringspan...***

<http://tinyurl.com/24fgess> (aug2008)

### ***saturn jan-sep2009...***

from saturn's gap overlooking the rings earth makes a final dive south of the ring plane before the northern crossing.

<http://tinyurl.com/24u8jeu>

### ***saturn: the motion picture...***

double-pump: saturn ring plane crossing and aspect (jan2009- sep2010)

<http://tinyurl.com/2emr5x5>

### ***lunar eclipse dec 2010...***

virtual views from gioja:

screenshot: <http://tinyurl.com/ssx-tle2010sw>

avi. clips: <http://tinyurl.com/ssx-2010eclipse>

### ***the force is with them...***

After exhaustive research, scientists have now determined why the southern skies are so abundantly gifted:



### *dark sky wow factor scale...*

Follows the Bortle sky rating (1-8) while concurrently and subjectively escalating the thrill, detail, and enjoyment like magnitudes; each rating providing 2.5x more wow.

As indicated, even a 20 minute drive from the city to a green zone yields nearly 40 times more wow to your obs session. Trust me.

bortle/more wow

white/x 1.0

red / x 2.5

orange/x 6.3

yellow/x 15.8

green/ x 39.8

blue / x 100.0

gray-black/ x 251.1

Don't be in too much of a hurry to experience those Bortle 8 skies.

Observationally speaking, once you've had Black (or Gray), you can never go back.

### *celestial navigation blues...*

Until it becomes innate by repetition (anymore it takes a conscious effort for me *not* to see the labeled radec grid superimposed on the sky), use a star atlas to find the coordinates' constellation and a planisphere to determine that constellation's visibility. Right ascension and declination are the sky's longitude and latitude, so think of the constellations as countries and stars as cities.

Another option is to pass on the right ascension/declination coordinates in favor of a target's altaz position (altitude: horizon = 0 deg, zenith = 90 deg. azimuth: compass point along the horizon; north = 0 deg, east = 90 deg, south = 180 deg, west = 270 deg).

Astro software programs often provide this info automatically.

Basic altaz (altitude/azimuth) navigation: Everyone is equipped with close to a 10 degree fist at arm's length. 4 fists stacked vertically from the horizon gets us close to 40 deg altitude. Facing north, 5 horizontal fists to the right along the horizon takes us to 50 deg azimuth (northeast). Stick out your thumb for another 5 deg.

### *there's something about mira...*

Cetus would arguably make a better mermaid than monster.

After all, the jewel-like Mira (omicron Ceti) seems more appropriately adorned by a beautiful sea nymph than forever found lodged in a whale's gullet.

The added mythological spice of the catfights with Cassiopeia alone would've been worth it.

The 10th magnitude variable, occasionally reaching 2nd-3rd mag at maxima, was even described as reaching a brightness "almost equal to Aldebaran" (0.85 mag) by J. Herschel in November 1779.

Mira maximas through 2015:

2010: Oct 21-31

2011: Sep 21-30

2012: Aug 21-31

2013: Jul 21-31

2014: Jun 21-31

2015: May 21-31

### ***more marathon...***

Naked-eye, bino, scope, sketching, and imaging marathons have all been attempted. Traditional marathon or a goto Messier 'Tour', there is no wrong way to enjoy the event. I've also participated in Mess-Cal marathons, incorporating the Caldwell's throughout the night (bagging as many as latitude allows). Alternating methods also allows the observer to become more intimate with the various target perspectives and appearances.

Those preparing for their maiden Marathon should get a good visual and starhopping fix on Messiers 74, 77, 33, 32, 110, as well as Ms 72, 73, and 30 after sunset in December/January while the targets still enjoy the luxury of a dark sky. You'll be glad you did.

Enjoy a February Marathon if weather permits.

The evening rush Messiers are cake, and totals over 100 are still easily attainable (40N).

It's hardly a requirement, though.

One can always wait and roll the meteorological dice in March.

And I've never cared for the initial handicap of April Marathons

(but don't let this stop you). As always, ymmv.

### ***the m74 sprint...***

While attempting early-March Marathons I've often made a mini-challenge of how many Ms can be bagged before m74 reaches threshold detection.

It's good dark adaption warm-up, plus most can be revisited later for a closer look.

### ***in too deep when...***

You secretly plan your honeymoon around the next total solar eclipse

Large collections of books, CDs, DVDs, etc. are arranged by Bortle-class color

You've hired a private plane to get above the clouds to witness a partial or total lunar eclipse

You can point to the current altaz of Luna, the planets, and the Messiers without going outside

You've used SkyAtlas2000 charts to wallpaper at least one full room of your house

### ***stranded- which instrument?...***

Actually, this is probably my 10th forum desert island stranding. Big binoculars are fine.

Just need to change travel agencies.

(still a few dozen to go...you thought i was going to give the answers to the anagrams didn't you?)

Also see *Saber Does The Stars (Vol 2/The Index Catalogue)*: <http://caldwellcatalogue.blogspot.com/>

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## **Memorizing the Maria: Jack and the Mutant Beaver** **Stephen Saber**

Jack and Jill went up to our moon to fetch a pail of water.  
(After breaking his crown and her tumbling after they both got really weird.)  
Jill set off to search the far side, while Jack was to take the pail and scout the near side.

Quite suddenly, Jack ran into Luna's only other inhabitant, the Mutant Beaver.  
Formerly representing the constellation Beavius (now occupied by the Pleiades), the Mutant Beaver had been forever banished to our moon by Cepheus for gnawing on Perseus' ankle during his fight with Cetus to save the lovely Andromeda.

Finally having someone to talk to, the Mutant Beaver refuses to let Jack pass until he's heard every silly astronomy joke he's been making up during his exile.  
Jack, to this day, endures the Mutant Beaver's ramblings.

Jill was last reported near the crater H.G. Wells.

*Stephen Saber is an Astronomical League Master Observer and author of the 'Starhoppers Guide to the Herschel 400'.*

*He curses the clouds from his home in Rock Island, Illinois.*

*Watch for the children's book Saber's Fractured Astro Mythology coming soon.*

\*\*\*\*\*

## **Asterisms: Ally's Braid** **Stephen Saber**

This beautiful parade of 7th and 8th magnitude stars wind south and east from etaTau in the Pleiades. I imagine this stellar chain as the flowing locks of Lady Alcyone.

Best enjoyed thru binoculars and low-power scopefields, the asterism is centered at radec 0348+2345. (Also see the SAC database at <http://www.saguaroastro.org>).

*[image courtesy of DSS]*

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## **A Matter Of Time** **Stephen Saber**

For some reason I can visualize a 45 light-minute trip to Jupiter better than the equivalent 5.4 Astronomical Units (810,000,000 km/502,200,000 miles) involved.

It's also an interesting temporal perspective to pass along to the public. When asked "How far is it to Saturn?" at Outreach events, the segue "It's about an hour and a half away" always piques more than sufficient curiosity. Following are some of the lightspeed distances from Earth to our neighbors during 2008. (Pluto started the year some 10 light-minutes farther than Neptune and put another 1.4 minutes between them by December.)

	mer	ven	mar	jup	sat	ura	nep
1jan	11.4m	9.3m	5.1m	51.8m	1h13m	2h51m	4h16m
1feb	6.0m	11.2m	6.5m	50.4m	1h10m	2h54m	4h18m
1mar	7.6m	12.3m	8.6m	47.7m	1h09m	2h56m	4h19m
1apr	10.7m	13.4m	11.2m	43.9m	1h11m	2h55m	4h16m
1may	9.4m	14.1m	13.6m	39.9m	1h14m	2h53m	4h12m
1jun	4.7m	14.4m	15.7m	36.5m	1h18m	2h49m	4h08m
1jul	6.8m	14.3m	17.6m	34.6m	1h22m	2h45m	4h04m
1aug	11.2m	13.7m	19.1m	35.2m	1h25m	2h41m	4h02m
1sep	9.2m	12.8m	20.1m	37.7m	1h26m	2h39m	4h02m
1oct	5.6m	11.6m	20.7m	41.3m	1h25m	2h40m	4h04m
1nov	10.1m	10.1m	20.8m	45.2m	1h23m	2h42m	4h08m
1dec	12.1m	8.4m	20.7m	48.3m	1h19m	2h46m	4h12m
mean	8.7m	12.1m	15.0m	42.7m	1h18m	2h48m	4h10m

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## The Parallax Project

(or How I Got An 'F' In Astronomy Class)

by Stephen Saber

Sometime between Shoemaker-Levy and the Millenium-class Hyakutake, a retired grade school science teacher had volunteered to be a guest speaker at one of our astroclub's monthly meetings. For the presentation, we would participate in one of her favorite annual astronomy class projects. Her pupils, we were told, had loved and cherished this exercise for over forty years.

We were each given a piece of paper, pencil, scotch tape, 7 plastic beads, Elmer's glue, a ruler, scissors, and maybe five feet of string.

Unconnected dots representing the Big Dipper asterism stars and their distances from us in lightyears were the only things shown on the paper.

After connecting the dots we were instructed to cut pieces of string at lengths relative to the star distances- longer lengths to represent more LYs. A bead would be glued to one end of each string, and the other end taped to the corresponding dot. The dangling beads would then be held overhead and observed from different angles to demonstrate parallax.

Looking around and seeing this large group of adults wielding little glue bottles and undersized scissors was pretty entertaining in itself, but something was nagging at me as I studiously began measuring out my strings. Held overhead, it would be the *closer* stars that should be represented by longer strings.

I supposed, as we were her first classroom of amateur astronomers, that this crucial flaw in her prized project had never been addressed.

But it didn't seem to be bothering any of my classmates either- several more occupied with untangling sticky tethered beads from gooey fingers- so I could've just played along.

Instead, my hand went up as our teacher neared to check everyone's progress.

Whether she just didn't get it or simply refused to let anything undermine her beloved project and 40 years of teaching it, my epiphany was offhandedly dismissed and I was firmly reprimanded to follow the directions as given.

The snickering from my gooey classmates at the scolding added a surreal reminiscent touch to this 'back in school' experience, as did the compulsion to disobey and finish the project accurately anyway. Which I did.

After class I brought my work of art home and even had it taped to a ceiling for several weeks. But it wasn't the unique perspective required to view our Dipper as a dipper that left an impression on me so much as the sense of our isolation and the all but infinite possible alternate views that might await us in the next millenia or so of space travel.

By the way, I didn't really get an 'F'. In fact, my actual grade remains a mystery as our guest teacher didn't come within 20 feet of me for the rest of the presentation.

That distance depending, of course, on where you were watching us from.

Here are the asterism stars' distances in lightyears for those wishing to share this fun and educational project with their club or class:

Alkaid 100

Mizar 78

Alioth 81

Megrez 65

Phecda 84

Merak 79

Dubhe 124

*[Left Ascension, September '08]*

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## **Caldwell Fever**

*c76 in Scorpius [courtesy of DSS]*

I bagged the Caldwells as an elective project en route to the A.L. Master Observer's award and found them to be a worthy and, in a few cases, challenging DSO refresher course. By request, the following is a jump-start for those in pursuit of Sir Patrick's favorite 109 non-Messier treasures. His concept was a forefather of post-Messier collections which has inspired, often by its notoriety, the slew of individual lists we see today. For the intermediate observer, this is a very nice warm-up for the Herschel 400 as most of the northern Caldwells also appear in that list.

Only 70 targets are required to receive this award, making the program available to observers in either hemisphere (but don't let

that stop you from traveling to enjoy the rest). The targets being numbered by declination also gives a much more intuitive idea as to their local altitude and availability.

Prefacing the Caldwell catalogue designation are the host constellation, its mid-point midnight culmination date, and respective Pocket Sky Atlas chart(s). Multiple targets within a constellation are ordered in suggested search sequences. Along with the object type, magnitude, and radec, an additional identifier is included for those who have not yet memorized this iconic deepsky database.

cma / jan02 / psa27

c64 oc 4.1 0719-2457 (ngc2362)

c58 oc 7.2 0718-1537 (ngc2360)

gem / jan05 / psa25  
c39 pn 9.9 0729+2055 (ngc2392)

mon / jan05 / psa25, 26  
c50 oc 4.8 0632+0452 (ngc2244)  
c49 bn — 0632+0503 (ngc2237-9)  
c46 bn 10.0 0639+0844 (ngc2261)  
c54 oc 7.6 0800-1047 (ngc2506)

pup / jan08 / psa28  
c71 oc 5.8 0752-3833 (ngc2477)

lyn / jan19 / psa23  
c25 gc 10.4 0738+3853 (ngc2419)

cnc / jan30 / psa24  
c48 gx 10.3 0910+0702 (ngc2775)

car / jan31 / psa39, 38  
c96 oc 3.8 0758-6052 (ngc2516)  
c90 pn 9.7 0921-5819 (ngc2867)  
c92 bn 6.2 1044-5952 (ngc3372)  
c102 oc 1.9 1043-6424 (ic2602)  
c91 oc 3.0 1106-5840 (ngc3532)

vel / feb13 / psa39  
c85 oc 2.5 0840-5304 (ic2391)  
c79 gc 6.7 1018-4625 (ngc3201)  
c74 pn 8.2 1008-4026 (ngc3132)

sex / feb22 / psa37  
c53 gx 9.1 1005-0743 (ngc3115)

cha / mar01 / psa30  
c109 pn — 1010-8052 (ngc3195)

leo / mar01 / psa34  
c40 gx 10.9 1120+1821 (ngc3626)

hya / mar15 / psa36, 46  
c59 pn 8.6 1025-1838 (ngc3242)  
c66 gc 10.2 1440-2632 (ngc5694)

cru / mar28 / psa49  
c99 dn — 1253-6300 (coalsack)  
c98 oc 6.9 1242-6258 (ngc4609)  
c94 oc 4.2 1254-6020 (ngc4755)

cen / mar30 / psa49, 48  
c100 oc 4.5 1137-6302 (ic2944)  
c97 oc 5.3 1136-6137 (ngc3766)  
c80 gc 3.6 1327-4729 (ngc5139)

c83 gx 9.5 1306-4928 (ngc4945)  
c77 gx 7.0 1326-4301 (ngc5128)  
c84 gc 7.6 1346-5122 (ngc5286)

mus / mar30 / psa50  
c108 gc 7.8 1226-7240 (ngc4372)  
c105 gc 7.3 1300-7053 (ngc4833)

com / apr02 / psa45  
c36 gx 9.8 1236+2758 (ngc4559)  
c38 gx 9.6 1236+2559 (ngc4565)  
c35 gx 11.4 1300+2759 (ngc4889)

cvn / apr07 / psa43  
c26 gx 10.6 1218+3749 (ngc4244)  
c32 gx 9.3 1242+3232 (ngc4631)  
c29 gx 9.8 1311+3703 (ngc5005)  
c21 gx 9.4 1228+4406 (ngc4449)

vir / apr11 / psa45  
c52 gx 9.3 1249-0548 (ngc4697)

cir / apr30 / psa48  
c88 oc 7.9 1506-5536 (ngc5823)

boo / may02 / psa44  
c45 gx 10.2 1338+0853 (ngc5248)

nor / may19 / psa58  
c89 oc 5.4 1619-5754 (ngc6087)

aps / may21 / psa60  
c107 gc 9.3 1626-7212 (ngc6101)

tra / may23 / psa60  
c95 oc 5.1 1604-6030 (ngc6025)

dra / may24 / psa31, 51  
c3 gx 9.7 1217+6928 (ngc4236)  
c6 pn 8.8 1759+6638 (ngc6543)

crv / may28 / psa36  
c60 gx 11.3 1202-1852 (ngc4038)  
c61 gx 13.0 1202-1853 (ngc4039)

sco / jun03 / psa58  
c76 oc 2.6 1654-4148 (ngc6231)  
c75 oc 5.8 1626-4040 (ngc6124)  
c69 pn 12.8 1714-3706 (ngc6302)

ara / jun10 / psa58  
c82 oc 5.2 1641-4846 (ngc6193)  
c86 gc 5.6 1741-5340 (ngc6397)  
c81 gc 8.1 1726-4825 (ngc6352)

cra / jun30 / psa69  
c78 gc 6.6 1808-4342 (ngc6541)  
c68 bn 9.7 1902-3657 (ngc6729)

sgr / jul07 / psa66  
c57 gx 9.3 1945-1448 (ngc6822)

pav / jul15 / psa70  
c93 gc 5.4 1911-5959 (ngc6752)  
c101 gx 9.0 1910-6351 (ngc6744)

vul / jul25 / psa62  
c37 oc 5.7 2012+2629 (ngc6885)

cyg / jul30 / psa62  
c15 pn 9.8 1945+5031 (ngc6826)  
c27 bn 7.5 2012+3821 (ngc6888)  
c20 bn 6.0 2059+4420 (ngc7000)  
c33 sn — 2056+3143 (ngc6992/5)  
c34 sn — 2046+3043 (ngc6960)  
c19 bn 10.0 2154+4716 (ic5146)

del / jul31 / psa64  
c47 gc 8.9 2034+0724 (ngc6934)  
c42 gc 10.6 2102+1611 (ngc7006)

aqr / aug25 / psa77, 76  
c55 pn 8.3 2104-1122 (ngc7009)  
c63 pn 6.5 2230-2048 (ngc7293)

lac / aug28 / psa73  
c16 oc 6.4 2215+4953 (ngc7243)

peg / sep01 / psa74  
c30 gx 9.5 2237+3425 (ngc7331)  
c44 gx 11.0 2305+1219 (ngc7479)  
c43 gx 10.5 0003+1609 (ngc7814)

tuc / sep17 / psa80  
c106 gc 4.0 0024-7205 (ngc104)  
c104 gc 6.6 0103-7051 (ngc362)

scl / sep26 / psa09  
c72 gx 8.2 0015-3911 (ngc55)  
c70 gx 8.1 0055-3741 (ngc300)  
c65 gx 7.1 0048-2517 (ngc253)

cep / sep29 / psa73, 71  
c12 gx 9.7 2035+6009 (ngc6946)  
c4 bn 6.8 2102+6812 (ngc7023)  
c9 bn 7.7 2259+6237 (sh2-155)  
c2 pn 11.6 0013+7232 (ngc40)  
c1 oc 8.1 0044+8520 (ngc188)



cas / oct09 / psa03, 01  
c11 bn 7.0 2321+6112 (ngc7635)  
c18 gx 9.2 0039+4820 (ngc185)  
c17 gx 9.3 0033+4830 (ngc147)  
c13 oc 6.4 0119+5820 (ngc457)  
c10 oc 7.1 0146+6115 (ngc663)  
c8 oc 9.5 0130+6318 (ngc559)

and / oct09 / psa03, 02  
c22 pn 9.2 2326+4233 (ngc7662)  
c28 oc 5.7 0158+3741 (ngc752)  
c23 gx 9.9 0223+4221 (ngc891)

cet / oct15 / psa07  
c62 gx 8.9 0047-2046 (ngc247)  
c56 pn 8.0 0047-1153 (ngc246)  
c51 gx 9.0 0105+0207 (ic1613)

for / nov02 / psa06  
c67 gx 9.2 0246-3017 (ngc1097)

per / nov07 / psa02  
c14 doc 4.3 0220+5708 (ngc869/884)  
c24 gx 11.6 0320+4131 (ngc1275)

hor / nov10 / psa08  
c87 gc 8.4 0312-5513 (ngc1261)

tau / nov30 / psa15  
c41 oc 1.0 0427+1600 (mel25)

dor / dec17 / psa20, D  
c103 bn 1.0 0539-6906 (ngc2070)

col / dec18 / psa18  
c73 gc 7.3 0514-4003 (ngc1851)

aur / dec21 / psa12  
c31 bn 6.0 0516+3416 (ic405)

cam / dec23 / psa11, 21  
c5 gx 9.2 0347+6806 (ic342)  
c7 gx 8.9 0737+6536 (ngc2403)

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## **ISS Outreach Fun and Facts**

### **Stephen Saber**

*[image courtesy of NASA]*

A small family gathering and near-overhead pass of the space station coincided with a long overdue break from the snowstorms and dreary clouds.

As a preview to the pass I shared some YouTube videos of ISS lunar and solar transits, close-up webcam trackings, and relative speed sims across the Earth's surface. Enduring the bitter zero degree temperature outside was a small price to pay for the event. The trek across the grand northwest to southeast arc lasted nearly

6 minutes with the station's acre of solar panels reflecting a peak brightness rivaling Venus. Luna was also high in the sky, and as the ISS headed in its general direction I had to reassure my little niece that there was no danger of the station running into our moon. Meanwhile, my sister was busy on her cellphone calling neighbors and screaming at them to hurry up and look outside.

A memorable experience for all, and we paid our respects by giving the crew a symbolic group wave.

Here's some basic info for others finding themselves in the position of narrating and fielding questions during the passes:

The ISS is traveling 17,500 mph (300 miles per minute) at an average altitude of 240 miles, completing an orbit about every 90 minutes.

The space station, including its large solar arrays, spans the length of a U.S. football field, including the end zones, and weighs 400 tons. With a crew of six astronauts, the complex has more livable area than a five-bedroom house, and has two bathrooms and a gymnasium.

The station marked its 10th anniversary of continuous human habitation on Nov 2, 2010. It has been visited by 196 individuals from eight different countries. There have been 103 launches to the space station: 67 Russian vehicles, 34 space shuttles, one European and one Japanese vehicle.

150 spacewalks totaling more than 950 hours have been conducted in support of space station assembly.

At its 10 year anniversary, the station had traveled the equivalent of eight round trips to our sun, or about 1.7 billion miles on its odometer.

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## **100 Southern Sky Double Stars** **Stephen Saber**

*[muLupus courtesy of DSS]*

No, it's not an Astronomical League Observe Program. But the southern sky certainly has its share of beautiful and interesting doubles, and I wanted to be ready for them on my next trip below the equator.

Here's a list of 100 gems for residents and northern visitors, including the SkyAtlas2000 charts where each can be found. Special thanks to the folks at IIS for their valuable contributions.

beta1Tuc SA 24  
00 32 -62 57 mag 4.5, 5.0 @ 27.1"

COO3 SA 24  
00 45 -62 30 mag 6.5, 8.5 @ 2.4"

lambdaTuc SA 24  
00 52 -69 30 mag 6.6, 8.0 @ 21.0"

betaPhe SA 18  
01 06 -46 42 mag 4.0, 4.0 @ 1.4"

zetaPhe SA 24

01 08 -55 15 mag 4.0, 7.0, 8.0 @  
0.8", 6.4"

kappaTuc SA 24

01 16 -68 52 mag 5.1, 7.3 @ 5.2"

DUN5 SA 24

01 40 -56 11 mag 5,8, 5.9 @ 10.5"

epsilonScl SA 18

01 46 -25 02 mag 5.5, 8.3 @ 4.7"

omegaFor SA 18

02 34 -28 13 mag 5.0, 7.7 @ 10.9"

DUN7 SA 24

02 40 -59 33 mag 7.0, 7.0 @ 36.7"

thetaEri SA 18

02 58 -40 18 mag 3.4, 4.5 @ 8.3"

HJ3568 SA 24

03 07 -78 59 mag 5.5, 8.0 @ 15.4"

alphaFor SA 18

03 12 -29 00 mag 4.0, 7.0 @ 1.9"

zetaRet SA 24

03 18 -62 30 mag 5.2, 5.5 @ 130"

DUN16 SA 18

03 49 -37 37 mag 4.9, 5.4 @ 8.0"

thetaRet SA 24

04 18 -63 15 mag 6.2, 8.2 @ 4.0"

RMK4 SA 24

04 24 -57 04 mag 7.1, 7.5 @ 5.7"

iotaPic SA 24

04 51 -53 27 mag 5.6, 6.4 @ 12.5"

gammaCae SA 19

05 04 -35 28 mag 4.5, 8.0 @ 2.9"

thetaPic SA 24

05 25 -52 19 mag 7.0, 7.0 @ 38.0"

betaLep SA 19

05 28 -20 45 mag 3.0, 7.5 @ 2.3"

DUN26 SA 24

06 12 -65 31 mag 7.0, 8.5 @ 20.9"

HJ3869 SA 19

06 33 -32 01 mag 5.7, 7.7 @ 24.9"

HJ3891 SA 19

06 46 -30 57 mag 6.1, 8.4 @ 4.9"

epsilonCMa SA 19

06 59 -28 58 mag 1.5, 8.0 @ 7.5"

gammaVol SA 25

07 09 -70 29 mag 3.9, 5.8 @ 13.6"

HJ3945 SA 19

07 17 -23 18 mag 4.8, 6.8 @ 26.8"

HJ3997 SA 24

07 35 -74 16 mag 7.0, 7.0 @ 2.0"

k1+2Puppis SA 19

07 39 -26 49 mag 4.4, 4.6 @ 9.8"

epsilonVol SA 25

08 08 -68 36 mag 4.5, 8.0 @ 6.1"

gammaVel SA 20

08 09 -47 20 mag 2.3, 4.4, 8.5, 9.4  
@ 41.2", 62.3", 94.0"

RMK8 SA 25

08 15 -62 54 mag 5.3, 7.6 @ 3.6"

DUN70 SA 20

08 30 -44 43 mag 5.0, 6.5 @ 5.0"

deltaVel SA 25

08 45 -54 41 mag 2.1, 5.1, 10.5 @  
2.6", 69.5"

DUN74 SA 25

08 57 -59 13 mag 4.9, 6.6 @ 40"

zetaAnt SA 20

09 31 -31 53 mag 6.3, 7.2 @ 8.0"

DUN82 SA 25

09 33 -86 00 mag 7.4, 8.0 @ 15.6"

upsilonCar SA 25

09 47 -65 03 mag 3.1, 6.1 @ 5.0"

DUN81 SA 20

09 54 -45 17 mag 5.7, 7.9 @ 5.4"

DUN95 SA 25

10 39 -55 36 mag 4.5, 6.5 @ 51.8"

HR4179 SA 25

10 39 -58 49 mag 6.2, 8.0 @ 26.3"

DUN94 SA 25

10 39 -59 11 mag 4.8, 8.2 @ 14.5"

muVel SA 20

10 47 -49 25 mag 2.9, 6.6 @ 2.6"

HJ4383 SA 25

10 54 -70 42 mag 6.5, 7.0 @ 1.5"

HJ4432 SA 25

11 23 -64 27 mag 5.5, 7.5 @ 2.5"

BSO6 SA 20

11 29 -42 40 mag 5.1, 7.4 @ 13.1"

HJ4455 SA 20

11 37 -33 34 mag 6.0, 8.1 @ 3.3"

DUN114 SA 20

11 40 -38 06 mag 6.5, 8.0 @ 17.0"

HR4628 SA 21

12 10 -34 42 mag 6.3, 8.3 @ 3.2"

DCen SA 21

12 14 -45 43 mag 5.5, 6.6 @ 2.9"

alphaCru SA 25

12 27 -63 05 mag 1.5, 1.8, 4.8 @  
4.4", 90.0"

gammaCru SA 25

12 32 -57 06 mag 1.8, 6.5 @ 125"

betaMus SA 25

12 46 -68 06 mag 3.7, 4.0 @ 1.4"

betaCru SA 25

12 48 -59 43 mag 1.3, 7.2 @ 373"

muCru SA 25

12 55 -57 11 mag 3.9, 5.0 @ 34.8"

thetaMus SA 25

13 08 -65 18 mag 5.5, 8.0 @ 5.3"

JCen Sa 25

13 23 -60 59 mag 4.5, 6.2 @ 61.7"

OCen SA 25

13 42 -54 53 mag 5.5, 7.0 @ 5.3"

3Cen SA 21

13 52 -32 59 mag 4.5, 6.0 @ 7.9"

NCen SA 25

13 52 -52 48 mag 5.5, 7.5 @ 18.0"

4Cen SA 21

13 53 -31 55 mag 4.8, 8.5 @ 14.8"

COO167 SA 25

14 15 -61 42 mag 6.5, 8.5 @ 2.8"

alphaCen SA 25

14 40 -60 50 mag 0.0, 1.5 @ 8.3"

alphaCir SA 25

14 43 -64 57 mag 3.4, 8.8 @ 15.7"

HR5520 SA 25

14 53 -73 11 mag 5.9, 7.6 @ 2.2"

piLup SA 21

15 05 -47 03 mag 4.6, 4.7 @ 1.7"

kappaLup SA 21

15 12 -48 44 mag 4.1, 6.0 @ 26.1"

muLup SA 25

15 19 -47 52 mag 5.0, 5.5, 7.0 @  
1.0", 22.7"

gammaCir SA 25

15 23 -59 19 mag 5.0, 5.0 @ 0.9"

zetaCrB SA 21

15 39 -36 38 mag 5.1, 6.0 @ 6.3"

RMK20 SA 25

15 48 -65 26 mag 6.5, 6.5 @ 1.9"

2Sco SA 21

15 54 -25 19 mag 4.7, 7.4 @ 2.3"

xiLup SA 21

15 57 -33 57 mag 5.5, 5.5 @ 10.4"

etaLup SA 22

16 00 -38 24 mag 3.5, 7.5 @ 15.2"

deltaAps SA 26

16 20 -78 41 mag 5.0, 5.0 @ 103"

sigmaSco SA 22

16 21 -25 35 mag 2.9, 8.7 @ 20.0"

epsilonNor SA 22

16 27 -47 33 mag 4.5, 7.5 @ 22.0"

alphaSco SA 22

16 29 -26 26 mag 1.0, 5.4 @ 2.9"

RAra SA 26

16 40 -56 59 mag 6.0, 8.5 @ 3.6"

36Oph SA 22

17 15 -26 33 mag 5.5, 5.5 @ 4.4"

44Ara SA 22

17 19 -46 39 mag 5.5, 8.5 @ 9.2"

HJ4978 SA 26

17 50 -53 37 mag 6.0, 9.0 @ 12.3"

HJ5014 SA 22

18 07 -43 25 mag 5.7, 5.7 @ 0.9"

etaSgr SA 22

18 18 -36 44 mag 3.2, 7.8 @ 3.6"

xiPav SA 26

18 23 -61 29 mag 4.3, 8.6 @ 3.3"

kappaCrA SA 22

18 33 -38 43 mag 6.0, 6.5 @ 21.4"

gammaCrA SA 22

19 06 -37 04 mag 4.8, 5.1 @ 1.3"

betaSgr SA 22

19 23 -44 27 mag 4.3, 7.4 @ 28.3"

DUN227 SA 26

19 53 -54 58 mag 6.0, 6.5 @ 22.9"

kappaSgr SA 23

20 24 -42 25 mag 6.0, 6.9 @ 0.8"

muOct SA 26

20 42 -75 21 mag 7.1, 7.6 @ 17.4"

RMK26 SA 26

20 52 -62 25 mag 6.6, 6.6 @ 2.5"

thetaInd SA 26

21 20 -53 26 mag 4.7, 7.2 @ 6.3"

HR8202 SA 23

21 27 -42 33 mag 5.6, 8.2 @ 2.9"

lambdaOct SA 26

21 51 -82 43 mag 5.5, 7.8 @ 2.8"

etaPsA SA 23

22 01 -28 27 mag 5.5, 6.5 @ 1.6"

betaPsA SA 23

22 32 -32 21 mag 4.5, 7.5 @ 30.4"

gammaPsA SA 23

22 53 -32 52 mag 4.6, 8.1 @ 4.2"

DUN246 SA 26

23 07 -50 41 mag 6.1, 6.8 @ 8.7"

thetaPhe SA 23

23 40 -46 38 mag 6.6, 7.2 @ 3.9"

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## **Herschel 400/PSA Index**

**Stephen Saber**

### *Astronomical League Herschel 400 Club Logo*

This supplement to S&T's Pocket Sky Atlas lists the Herschel 400 targets by NGC, chart, constellation, and declination order. A more indepth atlas such as SA2000 or Uranometria is recommended for those on their maiden voyage through these often challenging DSOs.

### **H400/PSA Index by NGC #**

NGC typ/mag/con / radec / psa

040 pn 10.2 cep 0010+7215 01  
129 oc 10.0 cas 0027+5957 01  
136 oc 11.3 cas 0029+6115 01  
157 gx 11.5 cet 0035-0824 07  
185 gx 11.0 cas 0039+4820 03  
205 gx 10.0 and 0040+4141 03 (m110)  
225 oc 09.0 cas 0043+6147 01  
246 pn 10.9 cet 0047-1207 07  
247 gx 10.0 cet 0047-2045 07  
253 gx 07.5 scl 0048-2518 07  
278 gx 12.5 cas 0052+4733 03  
288 gc 09.0 scl 0053-2635 07  
381 oc 09.5 cas 0108+6135 01  
404 gx 12.0 and 0110+3543 03  
436 oc 09.5 cas 0116+5849 01  
457 oc 08.0 cas 0119+5820 01  
488 gx 11.5 psc 0122+0516 05  
524 gx 12.0 psc 0125+0933 05  
559 oc 07.5 cas 0130+6318 01  
584 gx 12.0 cet 0131-0651 06  
596 gx 12.5 cet 0133-0701 06  
598 gx 07.0 tri 0134+3040 02 (m33)  
613 gx 11.0 scl 0134-2924 06  
615 gx 12.5 cet 0135-0719 06



637 oc 07.5 cas 0143+6400 01  
651 pn 12.0 per 0142+5134 02 (m76)  
654 oc 10.0 cas 0144+6153 01  
659 oc 10.0 cas 0144+6042 01  
663 oc 07.5 cas 0146+6115 01  
720 gx 11.5 cet 0153-1344 06  
752 oc 06.5 and 0158+3741 02  
772 gx 11.5 ari 0159+1900 04  
779 gx 12.0 cet 2000-0558 06  
869 oc 04.5 per 0219+5709 02  
884 oc 04.5 per 0222+5707 02  
891 gx 11.5 and 0223+4221 02  
908 gx 11.0 cet 0223-2113 06  
936 gx 11.0 cet 0228-0109 04  
1022 gx 12.5 cet 0239-0640 06  
1023 gx 11.0 per 0241+3903 02  
1027 oc 07.5 cas 0243+6113 02  
1052 gx 12.0 cet 0241-0815 06  
1055 gx 11.5 cet 0242+0026 04  
1084 gx 12.0 eri 0246-0735 06  
1245 oc 09.0 per 0315+4715 02  
1342 oc 07.0 per 0332+3720 02  
1407 gx 12.0 eri 0340-1834 17  
1444 oc 06.5 per 0349+5240 02  
1501 pn 13.5 cam 0407+6055 11  
1502 oc 05.5 cam 0408+6220 11

1513 oc 09.0 per 0410+4931 13  
1528 oc 06.5 per 0415+5114 13  
1535 pn 10.5 eri 0414-1244 17  
1545 oc 08.0 per 0421+5015 13  
1647 oc 06.0 tau 0446+1904 15  
1664 oc 08.0 aur 0451+4342 12  
1788 dn 09.0 ori 0507-0320 16  
1817 oc 08.0 tau 0512+1642 14  
1857 oc 08.5 aur 0520+3921 12  
1907 oc 10.5 aur 0528+3519 12  
1931 cn 13.0 aur 0531+3415 12  
1961 gx 11.5 cam 0542+6923 11  
1964 gx 11.5 lep 0533-2157 16  
1980 cn 02.5 ori 0535-0555 16/B  
1999 dn 10.0 ori 0537-0643 16  
2022 pn 13.0 ori 0537-0643 14  
2024 dn 10.0 ori 0542-0150 16  
2126 oc 10.0 aur 0603+4954 12  
2129 oc 07.0 gem 0601+2318 14  
2158 oc 12.0 gem 0608+0612 14  
2169 oc 07.0 ori 0608+1357 14  
2185 dn 10.0 mon 0611-0612 16  
2186 oc 09.0 ori 0612+0527 14  
2194 oc 10.5 ori 0614+1248 14  
2204 oc 09.5 cma 0616-1839 16

2215 oc 08.5 mon 0621-0717 27  
2232 oc 04.0 mon 0627-0445 27  
2244 cn 05.0 mon 0632+0452 25  
2251 oc 08.5 mon 0635+0822 25  
2264 cn 04.0 mon 0641+0953 25  
2266 oc 09.5 gem 0643+2658 23  
2281 oc 07.0 aur 0649+4104 23  
2286 oc 08.5 mon 0648-0310 25  
2301 oc 06.5 mon 0652+0028 25  
2304 oc 11.0 gem 0655+1801 25  
2311 oc 09.5 mon 0658-0435 27  
2324 oc 09.0 mon 0704+0103 25  
2335 oc 09.5 mon 0707-1005 27  
2343 oc 08.0 mon 0708-1039 27  
2353 oc 05.0 mon 0715-1018 27  
2354 oc 09.0 cma 0714-2544 27  
2355 oc 09.5 gem 0717+1347 25  
2360 oc 09.0 cma 0719-1537 27  
2362 oc 04.0 cma 0719-2457 27  
2371 pn 13.0 gem 0726+2929 23  
2372 pn 13.0 gem 0726+2930 23  
2392 pn 10.0 gem 0729+2055 25  
2395 oc 09.5 gem 0727+1335 25  
2403 gx 09.5 gem 0737+6537 21  
2419 gc 11.5 lyn 0738+3853 23

2420 oc 10.0 gem 0739+2134 25  
2421 oc 09.0 pup 0736-2037 26  
2422 oc 04.5 pup 0737-1430 26 (m47)  
2423 oc 07.0 pup 0737-1352 26  
2438 pn 11.5 pup 0742-1444 26  
2440 pn 11.5 pup 0742-1813 26  
2479 oc 09.6 pup 0755-1743 26  
2482 oc 08.5 pup 0755-2418 26  
2489 oc 09.5 pup 0756-3004 26  
2506 oc 08.5 mon 0800-1047 26  
2509 oc 09.5 pup 0801-1904 26  
2527 oc 08.0 pup 0805-2810 26  
2539 oc 08.0 pup 0810-1250 26  
2548 oc 05.0hya 0814-0548 26 (m48)  
2567 oc 08.5 pup 0818-3038 26  
2571 oc 07.5 pup 0819-2944 26  
2613 gx 11.0 pyx 0833-2258 26  
2627 oc 08.5 pyx 0837-2957 26  
2655 gx 11.5 cam 0856+7813 31  
2681 gx 11.5 uma 0854+5118 22  
2683 gx 11.0 lyn 0853+3325 22  
2742 gx 12.5 uma 0908+6029 31  
2768 gx 12.0 uma 0912+6003 31  
2775 gx 11.5 cnc 0910+0703 24  
2782 gx 12.5 lyn 0914+4007 22  
2787 gx 12.0 uma 0919+6913 21

2811 gx 13.0 hya 0916-1618 26  
2841 gx 10.5 uma 0922+5059 22  
2859 gx 12.0 lmi 0924+3432 22  
2903 gx 10.0 leo 0932+2129 35  
2950 gx 12.5 uma 0943+5851 31  
2964 gx 12.5 leo 0943+3151 33  
2974 gx 12.5 sex 0943-0343 37  
2976 gx 11.5 uma 0947+6755 31  
2985 gx 11.5 uma 0950+7217 21  
3034 gx 09.5 uma 0956+6941 31 (m82)  
3077 gx 11.5 uma 1003+6845 31  
3079 gx 12.0 uma 1002+5541 22  
3115 gx 10.5 sex 1005-0742 37  
3147 gx 12.0 dra 1017+7325 21  
3166 gx 11.5 sex 1014+0326 35  
3169 gx 11.5 sex 1014+0329 35  
3184 gx 11.0 uma 1018+4125 33  
3190 gx 12.0 leo 1018+2149 35  
3193 gx 12.5 leo 1019+2153 35  
3198 gx 11.0 uma 1020+4532 33  
3226 gx 12.5 leo 1024+1953 34  
3227 gx 12.0 leo 1024+1951 34  
3242 pn 10.0 hya 1025-1838 36  
3245 gx 12.0 lmi 1027+2830 33

3277 gx 13.0 lmi 1033+2830 33  
3294 gx 12.0 lmi 1036+3719 33  
3310 gx 11.5 uma 1039+5330 33  
3344 gx 11.5 lmi 1044+2455 34  
3377 gx 11.5 leo 1048+1359 34  
3379 gx 11.0 leo 1048+1235 34 (m105)  
3384 gx 11.5 leo 1048+1238 34  
3395 gx 12.5 lmi 1050+3259 33  
3412 gx 12.0 leo 1051+1324 34  
3414 gx 12.0 lmi 1051+2758 34  
3432 gx 12.0 lmi 1053+3637 33  
3486 gx 11.0 lmi 1101+2859 33  
3489 gx 11.5 leo 1100+1354 34  
3504 gx 12.0 lmi 1102+2807 34  
3521 gx 10.5 leo 1106+0002 34  
3556 gx 11.0 uma 1112+5541 43 (m108)  
3593 gx 12.0 leo 1115+1249 34  
3607 gx 12.0 leo 1117+1804 34  
3608 gx 12.5 leo 1117+1810 34  
3610 gx 12.0 uma 1118+5848 31  
3613 gx 12.0 uma 1119+5800 31  
3619 gx 12.5 uma 1119+5746 31  
3621 gx 10.0 hya 1118-3248 36  
3626 gx 12.0 leo 1120+1822 34  
3628 gx 10.5 leo 1120+1336 34  
3631 gx 11.5 uma 1121+5311 32  
3640 gx 12.0 leo 1121+0315 34

3655 gx 13.0 leo 1123+1636 34  
3665 gx 12.5 uma 1123+3854 32  
3675 gx 11.5 uma 1126+4336 32  
3686 gx 12.0 leo 1128+1714 34  
3726 gx 11.0 uma 1133+4702 32  
3729 gx 13.0 uma 1134+5308 32  
3810 gx 11.5 leo 1141+1129 34  
3813 gx 13.0 uma 1141+3633 32  
3877 gx 12.0 uma 1146+4730 32  
3893 gx 11.5 uma 1149+4843 32  
3898 gx 11.5 uma 1149+5606 32  
3900 gx 12.5 leo 1149+2702 34  
3912 gx 13.0 leo 1150+2629 34  
3938 gx 11.0 uma 1153+4408 32  
3941 gx 11.5 uma 1153+3700 32  
3945 gx 12.0 uma 1153+6041 31  
3949 gx 12.0 uma 1154+4752 32  
3953 gx 11.0 uma 1154+5220 32  
3962 gx 12.5 crt 1155-1358 36  
3982 gx 12.5 uma 1157+5508 32  
3992 gx 10.5 uma 1158+5323 32 (m109)  
3998 gx 12.0 uma 1158+5528 32  
4026 gx 12.0 uma 1159+5058 32

4027 gx 12.0 crv 1200-1915 36  
4030 gx 11.5 vir 1200-0105 36  
4036 gx 12.0 uma 1202+6154 31  
4038 gx 10.5 crv 1202-1851 36  
4041 gx 12.0 uma 1202+6209 31  
4051 gx 11.5 uma 1204+4433 32  
4085 gx 13.0 uma 1205+5022 32  
4088 gx 11.5 uma 1206+5033 32  
4102 gx 12.5 uma 1207+5243 32  
4111 gx 12.0 cvn 1207+4305 32  
4143 gx 12.5 cvn 1210+4233 32  
4147 gc 11.0 com 1210+1833 45/C  
4150 gx 12.5 com 1211+3025 32  
4151 gx 11.5 cvn 1211+3925 32  
4179 gx 12.0 vir 1213+0119 45  
4203 gx 12.0 com 1215+3313 32  
4214 gx 10.5 cvn 1216+3620 32  
4216 gx 11.0 vir 1216+1309 45/C  
4245 gx 12.5 com 1218+2937 32  
4251 gx 12.0 com 1218+2811 32  
4258 gx 09.5 cvn 1219+4719 32 (m106)  
4261 gx 11.5 vir 1219+0550 45  
4273 gx 12.5 vir 1220+0521 45  
4274 gx 11.5 com 1220+2937 32  
4278 gx 11.5 com 1220+2918 32  
4281 gx 12.5 vir 1220+0524 45  
4293 gx 11.5 com 1221+1824 45/C  
4303 gx 10.5 vir 1222+0429 45 (m61)

4314 gx 11.5 com 1223+2954 32  
4346 gx 12.5 cvn 1223+4700 32  
4350 gx 12.0 com 1224+1642 45/C  
4361 pn 11.0 crv 1225-1848 47  
4365 gx 11.0 vir 1225+0720 45/C  
4371 gx 12.0 vir 1225+1143 45/C  
4394 gx 12.0 com 1226+1813 45/C  
4414 gx 11.5 com 1226+3114 32  
4419 gx 12.5 com 1227+1503 45/C  
4429 gx 11.5 vir 1228+1107 45/C  
4435 gx 12.0 vir 1228+1305 45/C  
4438 gx 11.0 vir 1228+1301 45/C  
4442 gx 11.5 vir 1228+0949 45/C  
4448 gx 12.0 com 1228+2838 32  
4449 gx 10.5 cvn 1228+4406 32  
4450 gx 11.5 com 1229+1706 45/C  
4459 gx 12.0 com 1229+1359 45/C  
4473 gx 12.0 com 1230+1326 45/C  
4477 gx 11.5 com 1230+1339 45/C  
4478 gx 12.5 vir 1230+1220 45/C  
4485 gx 13.0 cvn 1231+4143 32  
4490 gx 11.0 cvn 1231+4139 32

4494 gx 11.0 com 1231+2547 45  
4526 gx 11.0 vir 1234+0743 45/C  
4527 gx 11.5 vir 1234+0240 45  
4535 gx 11.0 vir 1234+0813 45/C  
4536 gx 11.0 vir 1235+0212 45  
4546 gx 12.0 vir 1236-0347 45  
4548 gx 11.5 com 1236+1430 45/C (m91)  
4550 gx 12.5 vir 1236+1214 45/C  
4559 gx 10.5 com 1236+2758 32  
4565 gx 10.5 com 1236+2600 32  
4570 gx 12.0 vir 1237+0715 45/C  
4594 gx 09.5 vir 1240-1137 47 (m104)  
4596 gx 12.0 vir 1240+1011 45/C  
4618 gx 11.5 cvn 1242+4110 32  
4631 gx 10.0 cvn 1242+3233 32  
4636 gx 11.0 vir 1243+0242 45  
4643 gx 12.0 vir 1243+0159 45  
4654 gx 11.5 vir 1244+1308 45/C  
4656 gx 11.0 cvn 1244+3211 32  
4660 gx 12.5 vir 1246+1112 45/C  
4665 gx 11.5 vir 1245+0304 45  
4666 gx 11.5 vir 1245-0027 45  
4689 gx 12.0 com 1248+1346 45/C  
4697 gx 10.5 vir 1249-0548 45  
4698 gx 12.0 vir 1249+0830 45/C  
4699 gx 11.0 vir 1249-0840 47  
4725 gx 10.0 com 1250+2533 45  
4753 gx 11.0 vir 1252-0112 45  
4754 gx 12.0 vir 1252+1119 45/C

4762 gx 11.5 vir 1253+1114 45/C  
4781 gx 12.0 vir 1254-1032 47  
4800 gx 13.0 cvn 1255+4632 32  
4845 gx 12.5 vir 1258+0135 45  
4856 gx 11.5 vir 1259-1502 47  
4866 gx 12.0 vir 1259+1410 45/C  
4900 gx 12.0 vir 1301+3012 45  
4958 gx 12.0 vir 1306-0801 47  
4995 gx 12.0 vir 1310-0750 47  
5005 gx 11.5 cvn 1311+3703 43  
5033 gx 10.5 cvn 1314+3636 43  
5054 gx 11.5 vir 1317-1639 47  
5195 gx 09.5 cvn 1330+4716 32 (m51)  
5248 gx 11.0 boo 1337+0853 44  
5273 gx 12.5 cvn 1342+3538 43  
5322 gx 11.5 uma 1349+6012 32  
5363 gx 11.5 vir 1356+0516 44  
5364 gx 11.0 vir 1356+0502 44  
5466 gc 10.5 boo 1406+2832 44  
5473 gx 13.0 uma 1405+5454 42  
5474 gx 11.5 uma 1405+5340 42

5557 gx 13.0 boo 1418+3629 42  
5566 gx 11.5 vir 1420+0356 44  
5576 gx 12.0 vir 1421+0316 44  
5631 gx 12.5 uma 1427+5634 41  
5634 gc 11.0 vir 1430-0559 44  
5676 gx 12.0 boo 1433+4927 42  
5689 gx 12.5 boo 1436+4844 42  
5694 gc 11.0 hya 1440-2632 46  
5746 gx 11.5 vir 1445+0149 44  
5846 gx 11.5 vir 1507+0136 46  
5866 gx 11.5 dra 1507+5545 42 (m102)  
5897 gc 09.5 lib 1517-2101 46  
5907 gx 11.5 dra 1516+5619 42  
5982 gx 12.5 dra 1539+5921 42  
6118 gx 12.0 ser 1622-0217 54  
6144 gc 11.0 sco 1627-2602 56  
6171 gc 10.0 oph 1633-1303 56 (m107)  
6207 gx 12.5 her 1643+3650 52  
6217 gx 12.5 umi 1633+7812 41  
6229 gc 10.5 her 1647+4732 52  
6235 gc 11.0 oph 1653-2211 56  
6284 gc 10.5 oph 1705-2446 56  
6287 gc 11.0 oph 1705-2242 56  
6293 gc 09.5 oph 1710-2635 56  
6304 gc 10.0 oph 1715-2928 56  
6316 gc 10.0 oph 1717-2808 56  
6342 gc 11.5 oph 1721-1935 56  
6355 gc 09.5 oph 1724-2621 56  
6356 gc 09.5 oph 1724-1749 56  
6369 pn 14.0 oph 1729-2346 56

6401 gc 07.5 oph 1739-2355 56  
6426 gc 12.5 oph 1744+0300 54  
6440 gc 12.0 sgr 1749-2022 67  
6445 pn 13.0 sgr 1749-2001 67  
6451 oc 08.5 sco 1751-3013 58  
6514 cn 05.0 sgr 1802-2302 67 (m20)  
6517 gc 13.0 oph 1802-0858 67  
6520 oc 07.5 sgr 1803-2754 67  
6522 gc 10.5 sgr 1804-3002 67  
6528 gc 11.0 sgr 1805-3003 67  
6540 oc 14.0 sgr 1806-2749 67  
6543 pn 09.0 dra 1759+6638 51  
6544 gc 07.5 sgr 1807-2500 67  
6553 gc 10.0 sgr 1809-2554 67  
6568 oc 08.5 sgr 1813-2136 67  
6569 gc 10.5 sgr 1814-3150 67  
6583 oc 12.0 sgr 1816-2208 67  
6624 gc 09.5 sgr 1824-3022 67  
6629 pn 12.0 sgr 1826-2312 67  
6633 oc 05.5 oph 1828-0634 65

6638 gc 10.0 sgr 1831-2530 67  
6642 gc 10.5 sgr 1832-2329 67  
6645 oc 08.5 sgr 1833-1654 67  
6664 oc 09.0 sct 1837-0813 67  
6712 gc 10.0 sct 1853-0842 67  
6755 oc 09.0 aql 1908+0414 65  
6756 oc 10.5 aql 1909+0441 65  
6781 pn 12.5 aql 1919+0632 65  
6802 oc 09.0 vul 1931+2016 64  
6818 pn 10.0 sgr 1944-1409 66  
6823 cn 10.0 vul 1943+2318 62  
6826 pn 09.0 cyg 1945+5031 62  
6830 oc 09.0 vul 1951+2304 62  
6834 oc 10.0 cyg 1952+2925 62  
6866 oc 09.0 cyg 2004+4400 62  
6882 oc 05.5 vul 2012+2633 62  
6885 oc 09.0 vul 2012+2629 62  
6905 pn 12.0 del 2022+2006 64  
6910 oc 07.5 cyg 2023+4047 62  
6934 gc 10.0 del 2034+2410 64  
6939 oc 10.0 cep 2031+6038 61  
6940 oc 06.5 vul 2035+2818 62  
6946 gx 10.5 cep 2035+6009 61  
7000 dn 05.5 cyg 2102+4412 62  
7006 gc 11.5 del 2102+1611 64  
7008 pn 13.5 cyg 2101+5433 62  
7009 pn 08.5 aqr 2104-1122 77  
7044 oc 11.5 cyg 2113+4229 62  
7062 oc 11.5 cyg 2123+4623 62  
7086 oc 11.0 cyg 2131+5135 62  
7128 oc 11.5 cyg 2144+5343 62

7142 oc 10.0 cep 2146+6548 71  
7160 oc 06.5 cep 2154+6236 71  
7209 oc 08.0 lac 2205+4630 73  
7217 gx 11.5 peg 2208+3121 73  
7243 oc 06.5 lac 2215+4953 73  
7296 oc 09.5 lac 2228+5217 73  
7331 gx 10.5 peg 2237+3426 72  
7380 cn 09.0 cep 2247+5806 72  
7448 gx 12.5 peg 2300+1559 74  
7479 gx 11.5 peg 2305+1219 74  
7510 oc 09.5 cep 2312+6034 71  
7606 gx 11.5 aqr 2319-0830 76  
7662 pn 09.0 and 2326+4233 03  
7686 oc 08.0 and 2330+4908 03  
7723 gx 12.0 aqr 2339-1258 76  
7727 gx 11.5 aqr 2340-1218 76  
7789 oc 09.5 cas 2357+5644 03  
7790 oc 07.0 cas 2358+6113 03  
7814 gx 12.0 peg 0005+1608 74

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NGC typ/mag/con / radec / psa

040 pn 10.2 cep 0010+7215 01  
129 oc 10.0 cas 0027+5957 01  
136 oc 11.3 cas 0029+6115 01  
225 oc 09.0 cas 0043+6147 01  
381 oc 09.5 cas 0108+6135 01  
436 oc 09.5 cas 0116+5849 01  
457 oc 08.0 cas 0119+5820 01  
559 oc 07.5 cas 0130+6318 01  
637 oc 07.5 cas 0143+6400 01  
654 oc 10.0 cas 0144+6153 01  
659 oc 10.0 cas 0144+6042 01  
663 oc 07.5 cas 0146+6115 01  
  
598 gx 07.0 tri 0134+3040 02 (m33)  
651 pn 12.0 per 0142+5134 02 (m76)  
752 oc 06.5 and 0158+3741 02  
869 oc 04.5 per 0219+5709 02  
884 oc 04.5 per 0222+5707 02  
891 gx 11.5 and 0223+4221 02  
1023 gx 11.0 per 0241+3903 02  
1027 oc 07.5 cas 0243+6113 02  
1245 oc 09.0 per 0315+4715 02  
1342 oc 07.0 per 0332+3720 02  
1444 oc 06.5 per 0349+5240 02  
  
185 gx 11.0 cas 0039+4820 03  
205 gx 10.0 and 0040+4141 03 (m110)  
278 gx 12.5 cas 0052+4733 03  
404 gx 12.0 and 0110+3543 03



7662 pn 09.0 and 2326+4233 03  
7686 oc 08.0 and 2330+4908 03  
7789 oc 09.5 cas 2357+5644 03  
7790 oc 07.0 cas 2358+6113 03

772 gx 11.5 ari 0159+1900 04  
936 gx 11.0 cet 0228-0109 04  
1055 gx 11.5 cet 0242+0026 04

488 gx 11.5 psc 0122+0516 05  
524 gx 12.0 psc 0125+0933 05

584 gx 12.0 cet 0131-0651 06  
596 gx 12.5 cet 0133-0701 06  
613 gx 11.0 scl 0134-2924 06  
615 gx 12.5 cet 0135-0719 06  
720 gx 11.5 cet 0153-1344 06  
779 gx 12.0 cet 2000-0558 06  
908 gx 11.0 cet 0223-2113 06  
1022 gx 12.5 cet 0239-0640 06  
1052 gx 12.0 cet 0241-0815 06  
1084 gx 12.0 eri 0246-0735 06

157 gx 11.5 cet 0035-0824 07  
246 pn 10.9 cet 0047-1207 07  
247 gx 10.0 cet 0047-2045 07  
253 gx 07.5 scl 0048-2518 07  
288 gc 09.0 scl 0053-2635 07

1501 pn 13.5 cam 0407+6055 11  
1502 oc 05.5 cam 0408+6220 11  
1961 gx 11.5 cam 0542+6923 11

1664 oc 08.0 aur 0451+4342 12  
1857 oc 08.5 aur 0520+3921 12  
1907 oc 10.5 aur 0528+3519 12  
1931 cn 13.0 aur 0531+3415 12  
2126 oc 10.0 aur 0603+4954 12

1513 oc 09.0 per 0410+4931 13  
1528 oc 06.5 per 0415+5114 13  
1545 oc 08.0 per 0421+5015 13

1817 oc 08.0 tau 0512+1642 14  
2022 pn 13.0 ori 0537-0643 14  
2129 oc 07.0 gem 0601+2318 14  
2158 oc 12.0 gem 0608+0612 14  
2169 oc 07.0 ori 0608+1357 14  
2186 oc 09.0 ori 0612+0527 14  
2194 oc 10.5 ori 0614+1248 14

1647 oc 06.0 tau 0446+1904 15

1788 dn 09.0 ori 0507-0320 16  
1964 gx 11.5 lep 0533-2157 16  
1980 cn 02.5 ori 0535-0555 16/B  
1999 dn 10.0 ori 0537-0643 16  
2024 dn 10.0 ori 0542-0150 16  
2185 dn 10.0 mon 0611-0612 16  
2204 oc 09.5 cma 0616-1839 16

1407 gx 12.0 eri 0340-1834 17  
1535 pn 10.5 eri 0414-1244 17

2403 gx 09.5 gem 0737+6537 21  
2787 gx 12.0 uma 0919+6913 21  
2985 gx 11.5 uma 0950+7217 21  
3147 gx 12.0 dra 1017+7325 21

2681 gx 11.5 uma 0854+5118 22  
2683 gx 11.0 lyn 0853+3325 22  
2782 gx 12.5 lyn 0914+4007 22  
2841 gx 10.5 uma 0922+5059 22  
2859 gx 12.0 lmi 0924+3432 22  
3079 gx 12.0 uma 1002+5541 22

2266 oc 09.5 gem 0643+2658 23  
2281 oc 07.0 aur 0649+4104 23  
2371 pn 13.0 gem 0726+2929 23  
2372 pn 13.0 gem 0726+2930 23  
2419 gc 11.5 lyn 0738+3853 23

2775 gx 11.5 cnc 0910+0703 24

2244 cn 05.0 mon 0632+0452 25  
2251 oc 08.5 mon 0635+0822 25  
2264 cn 04.0 mon 0641+0953 25  
2286 oc 08.5 mon 0648-0310 25  
2301 oc 06.5 mon 0652+0028 25  
2304 oc 11.0 gem 0655+1801 25  
2324 oc 09.0 mon 0704+0103 25  
2355 oc 09.5 gem 0717+1347 25  
2392 pn 10.0 gem 0729+2055 25  
2395 oc 09.5 gem 0727+1335 25  
2420 oc 10.0 gem 0739+2134 25

2421 oc 09.0 pup 0736-2037 26  
2422 oc 04.5 pup 0737-1430 26 (m47)  
2423 oc 07.0 pup 0737-1352 26  
2438 pn 11.5 pup 0742-1444 26  
2440 pn 11.5 pup 0742-1813 26  
2479 oc 09.6 pup 0755-1743 26  
2482 oc 08.5 pup 0755-2418 26  
2489 oc 09.5 pup 0756-3004 26  
2506 oc 08.5 mon 0800-1047 26  
2509 oc 09.5 pup 0801-1904 26

2527 oc 08.0 pup 0805-2810 26  
2539 oc 08.0 pup 0810-1250 26  
2548 oc 05.0 hya 0814-0548 26 (m48)  
2567 oc 08.5 pup 0818-3038 26  
2571 oc 07.5 pup 0819-2944 26  
2613 gx 11.0 pyx 0833-2258 26  
2627 oc 08.5 pyx 0837-2957 26  
2811 gx 13.0 hya 0916-1618 26

2215 oc 08.5 mon 0621-0717 27  
2232 oc 04.0 mon 0627-0445 27  
2311 oc 09.5 mon 0658-0435 27  
2335 oc 09.5 mon 0707-1005 27  
2343 oc 08.0 mon 0708-1039 27  
2353 oc 05.0 mon 0715-1018 27  
2354 oc 09.0 cma 0714-2544 27  
2360 oc 09.0 cma 0719-1537 27  
2362 oc 04.0 cma 0719-2457 27

2655 gx 11.5 cam 0856+7813 31  
2742 gx 12.5 uma 0908+6029 31  
2768 gx 12.0 uma 0912+6003 31  
2950 gx 12.5 uma 0943+5851 31  
2976 gx 11.5 uma 0947+6755 31  
3034 gx 09.5 uma 0956+6941 31 (m82)  
3077 gx 11.5 uma 1003+6845 31  
3610 gx 12.0 uma 1118+5848 31  
3613 gx 12.0 uma 1119+5800 31  
3619 gx 12.5 uma 1119+5746 31  
3945 gx 12.0 uma 1153+6041 31  
4036 gx 12.0 uma 1202+6154 31  
4041 gx 12.0 uma 1202+6209 31

3631 gx 11.5 uma 1121+5311 32  
3665 gx 12.5 uma 1123+3854 32  
3675 gx 11.5 uma 1126+4336 32  
3726 gx 11.0 uma 1133+4702 32  
3729 gx 13.0 uma 1134+5308 32  
3813 gx 13.0 uma 1141+3633 32  
3877 gx 12.0 uma 1146+4730 32  
3893 gx 11.5 uma 1149+4843 32  
3898 gx 11.5 uma 1149+5606 32  
3938 gx 11.0 uma 1153+4408 32  
3941 gx 11.5 uma 1153+3700 32  
3949 gx 12.0 uma 1154+4752 32  
3953 gx 11.0 uma 1154+5220 32  
3982 gx 12.5 uma 1157+5508 32  
3992 gx 10.5 uma 1158+5323 32 (m109)  
3998 gx 12.0 uma 1158+5528 32  
4026 gx 12.0 uma 1159+5058 32  
4051 gx 11.5 uma 1204+4433 32  
4085 gx 13.0 uma 1205+5022 32  
4088 gx 11.5 uma 1206+5033 32

4102 gx 12.5 uma 1207+5243 32  
4111 gx 12.0 cvn 1207+4305 32  
4143 gx 12.5 cvn 1210+4233 32  
4150 gx 12.5 com 1211+3025 32  
4151 gx 11.5 cvn 1211+3925 32  
4203 gx 12.0 com 1215+3313 32  
4214 gx 10.5 cvn 1216+3620 32  
4245 gx 12.5 com 1218+2937 32  
4251 gx 12.0 com 1218+2811 32  
4258 gx 09.5 cvn 1219+4719 32 (m106)  
4274 gx 11.5 com 1220+2937 32  
4278 gx 11.5 com 1220+2918 32  
4314 gx 11.5 com 1223+2954 32  
4346 gx 12.5 cvn 1223+4700 32  
4414 gx 11.5 com 1226+3114 32  
4485 gx 13.0 cvn 1231+4143 32  
4490 gx 11.0 cvn 1231+4139 32  
4559 gx 10.5 com 1236+2758 32  
4565 gx 10.5 com 1236+2600 32  
4448 gx 12.0 com 1228+2838 32  
4449 gx 10.5 cvn 1228+4406 32  
4618 gx 11.5 cvn 1242+4110 32  
4631 gx 10.0 cvn 1242+3233 32  
4656 gx 11.0 cvn 1244+3211 32  
4800 gx 13.0 cvn 1255+4632 32  
5195 gx 09.5 cvn 1330+4716 32 (m51)  
5322 gx 11.5 uma 1349+6012 32

2964 gx 12.5 leo 0943+3151 33  
3184 gx 11.0 uma 1018+4125 33  
3198 gx 11.0 uma 1020+4532 33  
3245 gx 12.0 lmi 1027+2830 33  
3277 gx 13.0 lmi 1033+2830 33  
3294 gx 12.0 lmi 1036+3719 33  
3310 gx 11.5 uma 1039+5330 33  
3395 gx 12.5 lmi 1050+3259 33  
3432 gx 12.0 lmi 1053+3637 33  
3486 gx 11.0 lmi 1101+2859 33

3226 gx 12.5 leo 1024+1953 34  
3227 gx 12.0 leo 1024+1951 34  
3344 gx 11.5 lmi 1044+2455 34  
3377 gx 11.5 leo 1048+1359 34  
3379 gx 11.0 leo 1048+1235 34 (m105)  
3384 gx 11.5 leo 1048+1238 34  
3412 gx 12.0 leo 1051+1324 34  
3414 gx 12.0 lmi 1051+2758 34  
3489 gx 11.5 leo 1100+1354 34  
3504 gx 12.0 lmi 1102+2807 34  
3521 gx 10.5 leo 1106+0002 34  
3593 gx 12.0 leo 1115+1249 34  
3607 gx 12.0 leo 1117+1804 34

3608 gx 12.5 leo 1117+1810 34  
3626 gx 12.0 leo 1120+1822 34  
3628 gx 10.5 leo 1120+1336 34  
3640 gx 12.0 leo 1121+0315 34  
3655 gx 13.0 leo 1123+1636 34  
3686 gx 12.0 leo 1128+1714 34  
3810 gx 11.5 leo 1141+1129 34  
3900 gx 12.5 leo 1149+2702 34  
3912 gx 13.0 leo 1150+2629 34

2903 gx 10.0 leo 0932+2129 35  
3166 gx 11.5 sex 1014+0326 35  
3169 gx 11.5 sex 1014+0329 35  
3190 gx 12.0 leo 1018+2149 35  
3193 gx 12.5 leo 1019+2153 35

3242 pn 10.0 hya 1025-1838 36  
3621 gx 10.0 hya 1118-3248 36  
3962 gx 12.5 crt 1155-1358 36  
4027 gx 12.0 crv 1200-1915 36  
4030 gx 11.5 vir 1200-0105 36  
4038 gx 10.5 crv 1202-1851 36

2974 gx 12.5 sex 0943-0343 37  
3115 gx 10.5 sex 1005-0742 37

5631 gx 12.5 uma 1427+5634 41  
6217 gx 12.5 umi 1633+7812 41

5473 gx 13.0 uma 1405+5454 42  
5474 gx 11.5 uma 1405+5340 42  
5557 gx 13.0 boo 1418+3629 42  
5676 gx 12.0 boo 1433+4927 42  
5689 gx 12.5 boo 1436+4844 42  
5866 gx 11.5 dra 1507+5545 42 (m102)  
5907 gx 11.5 dra 1516+5619 42  
5982 gx 12.5 dra 1539+5921 42

3556 gx 11.0 uma 1112+5541 43 (m108)  
5005 gx 11.5 cvn 1311+3703 43  
5033 gx 10.5 cvn 1314+3636 43  
5273 gx 12.5 cvn 1342+3538 43

5248 gx 11.0 boo 1337+0853 44  
5363 gx 11.5 vir 1356+0516 44  
5364 gx 11.0 vir 1356+0502 44  
5466 gc 10.5 boo 1406+2832 44  
5566 gx 11.5 vir 1420+0356 44  
5576 gx 12.0 vir 1421+0316 44  
5634 gc 11.0 vir 1430-0559 44  
5746 gx 11.5 vir 1445+0149 44

4147 gc 11.0 com 1210+1833 45/C  
4179 gx 12.0 vir 1213+0119 45  
4216 gx 11.0 vir 1216+1309 45/C  
4261 gx 11.5 vir 1219+0550 45  
4273 gx 12.5 vir 1220+0521 45  
4281 gx 12.5 vir 1220+0524 45  
4293 gx 11.5 com 1221+1824 45/C  
4303 gx 10.5 vir 1222+0429 45 (m61)  
4350 gx 12.0 com 1224+1642 45/C  
4365 gx 11.0 vir 1225+0720 45/C  
4371 gx 12.0 vir 1225+1143 45/C  
4394 gx 12.0 com 1226+1813 45/C  
4419 gx 12.5 com 1227+1503 45/C  
4429 gx 11.5 vir 1228+1107 45/C  
4435 gx 12.0 vir 1228+1305 45/C  
4438 gx 11.0 vir 1228+1301 45/C  
4442 gx 11.5 vir 1228+0949 45/C  
4450 gx 11.5 com 1229+1706 45/C  
4459 gx 12.0 com 1229+1359 45/C  
4473 gx 12.0 com 1230+1326 45/C  
4477 gx 11.5 com 1230+1339 45/C  
4478 gx 12.5 vir 1230+1220 45/C  
4494 gx 11.0 com 1231+2547 45  
4526 gx 11.0 vir 1234+0743 45/C  
4527 gx 11.5 vir 1234+0240 45  
4535 gx 11.0 vir 1234+0813 45/C  
4536 gx 11.0 vir 1235+0212 45  
4546 gx 12.0 vir 1236-0347 45  
4548 gx 11.5 com 1236+1430 45/C (m91)  
4550 gx 12.5 vir 1236+1214 45/C  
4570 gx 12.0 vir 1237+0715 45/C  
4596 gx 12.0 vir 1240+1011 45/C  
4636 gx 11.0 vir 1243+0242 45  
4643 gx 12.0 vir 1243+0159 45  
4654 gx 11.5 vir 1244+1308 45/C  
4660 gx 12.5 vir 1246+1112 45/C  
4665 gx 11.5 vir 1245+0304 45  
4666 gx 11.5 vir 1245-0027 45  
4689 gx 12.0 com 1248+1346 45/C  
4697 gx 10.5 vir 1249-0548 45  
4698 gx 12.0 vir 1249+0830 45/C  
4725 gx 10.0 com 1250+2533 45  
4753 gx 11.0 vir 1252-0112 45  
4754 gx 12.0 vir 1252+1119 45/C  
4762 gx 11.5 vir 1253+1114 45/C  
4845 gx 12.5 vir 1258+0135 45  
4866 gx 12.0 vir 1259+1410 45/C  
4900 gx 12.0 vir 1301+3012 45  
  
5694 gc 11.0 hya 1440-2632 46  
5846 gx 11.5 vir 1507+0136 46  
5897 gc 09.5 lib 1517-2101 46

4361 pn 11.0 crv 1225-1848 47  
4594 gx 09.5 vir 1240-1137 47 (m104)  
4699 gx 11.0 vir 1249-0840 47  
4781 gx 12.0 vir 1254-1032 47  
4856 gx 11.5 vir 1259-1502 47  
4958 gx 12.0 vir 1306-0801 47  
4995 gx 12.0 vir 1310-0750 47  
5054 gx 11.5 vir 1317-1639 47

6543 pn 09.0 dra 1759+6638 51

6207 gx 12.5 her 1643+3650 52  
6229 gc 10.5 her 1647+4732 52

6118 gx 12.0 ser 1622-0217 54  
6426 gc 12.5 oph 1744+0300 54

6144 gc 11.0 sco 1627-2602 56  
6171 gc 10.0 oph 1633-1303 56 (m107)  
6235 gc 11.0 oph 1653-2211 56  
6284 gc 10.5 oph 1705-2446 56  
6287 gc 11.0 oph 1705-2242 56  
6293 gc 09.5 oph 1710-2635 56  
6304 gc 10.0 oph 1715-2928 56  
6316 gc 10.0 oph 1717-2808 56  
6342 gc 11.5 oph 1721-1935 56  
6355 gc 09.5 oph 1724-2621 56  
6356 gc 09.5 oph 1724-1749 56  
6369 pn 14.0 oph 1729-2346 56  
6401 gc 07.5 oph 1739-2355 56

6451 oc 08.5 sco 1751-3013 58

6939 oc 10.0 cep 2031+6038 61  
6946 gx 10.5 cep 2035+6009 61

6823 cn 10.0 vul 1943+2318 62  
6826 pn 09.0 cyg 1945+5031 62  
6830 oc 09.0 vul 1951+2304 62  
6834 oc 10.0 cyg 1952+2925 62  
6866 oc 09.0 cyg 2004+4400 62  
6882 oc 05.5 vul 2012+2633 62  
6885 oc 09.0 vul 2012+2629 62  
6910 oc 07.5 cyg 2023+4047 62  
6940 oc 06.5 vul 2035+2818 62  
7000 dn 05.5 cyg 2102+4412 62  
7008 pn 13.5 cyg 2101+5433 62  
7044 oc 11.5 cyg 2113+4229 62  
7062 oc 11.5 cyg 2123+4623 62  
7086 oc 11.0 cyg 2131+5135 62  
7128 oc 11.5 cyg 2144+5343 62

6802 oc 09.0 vul 1931+2016 64  
6905 pn 12.0 del 2022+2006 64  
6934 gc 10.0 del 2034+2410 64  
7006 gc 11.5 del 2102+1611 64

6633 oc 05.5 oph 1828-0634 65  
6755 oc 09.0 aql 1908+0414 65  
6756 oc 10.5 aql 1909+0441 65  
6781 pn 12.5 aql 1919+0632 65

6818 pn 10.0 sgr 1944-1409 66

6440 gc 12.0 sgr 1749-2022 67  
6445 pn 13.0 sgr 1749-2001 67  
6514 cn 05.0 sgr 1802-2302 67 (m20)  
6517 gc 13.0 oph 1802-0858 67  
6520 oc 07.5 sgr 1803-2754 67  
6522 gc 10.5 sgr 1804-3002 67  
6528 gc 11.0 sgr 1805-3003 67  
6540 oc 14.0 sgr 1806-2749 67  
6544 gc 07.5 sgr 1807-2500 67  
6553 gc 10.0 sgr 1809-2554 67  
6568 oc 08.5 sgr 1813-2136 67  
6569 gc 10.5 sgr 1814-3150 67  
6583 oc 12.0 sgr 1816-2208 67  
6624 gc 09.5 sgr 1824-3022 67  
6629 pn 12.0 sgr 1826-2312 67  
6638 gc 10.0 sgr 1831-2530 67  
6642 gc 10.5 sgr 1832-2329 67  
6645 oc 08.5 sgr 1833-1654 67  
6664 oc 09.0 sct 1837-0813 67  
6712 gc 10.0 sct 1853-0842 67

7142 oc 10.0 cep 2146+6548 71  
7160 oc 06.5 cep 2154+6236 71  
7510 oc 09.5 cep 2312+6034 71

7331 gx 10.5 peg 2237+3426 72  
7380 cn 09.0 cep 2247+5806 72

7209 oc 08.0 lac 2205+4630 73  
7217 gx 11.5 peg 2208+3121 73  
7243 oc 06.5 lac 2215+4953 73  
7296 oc 09.5 lac 2228+5217 73

7448 gx 12.5 peg 2300+1559 74  
7479 gx 11.5 peg 2305+1219 74  
7814 gx 12.0 peg 0005+1608 74

7606 gx 11.5 aqr 2319-0830 76  
7723 gx 12.0 aqr 2339-1258 76  
7727 gx 11.5 aqr 2340-1218 76

7009 pn 08.5 aqr 2104-1122 77



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NGC typ/mag/con / radec / psa

205 gx 10.0 and 0040+4141 03 (m110)

404 gx 12.0 and 0110+3543 03

752 oc 06.5 and 0158+3741 02

891 gx 11.5 and 0223+4221 02

7662 pn 09.0 and 2326+4233 03

7686 oc 08.0 and 2330+4908 03

6755 oc 09.0 aql 1908+0414 65

6756 oc 10.5 aql 1909+0441 65

6781 pn 12.5 aql 1919+0632 65

7009 pn 08.5 aqr 2104-1122 77

7606 gx 11.5 aqr 2319-0830 76

7723 gx 12.0 aqr 2339-1258 76

7727 gx 11.5 aqr 2340-1218 76

772 gx 11.5 ari 0159+1900 04

1664 oc 08.0 aur 0451+4342 12

1857 oc 08.5 aur 0520+3921 12

1907 oc 10.5 aur 0528+3519 12

1931 cn 13.0 aur 0531+3415 12

2126 oc 10.0 aur 0603+4954 12

2281 oc 07.0 aur 0649+4104 23

5248 gx 11.0 boo 1337+0853 44

5466 gc 10.5 boo 1406+2832 44

5557 gx 13.0 boo 1418+3629 42

5676 gx 12.0 boo 1433+4927 42

5689 gx 12.5 boo 1436+4844 42

1501 pn 13.5 cam 0407+6055 11

1502 oc 05.5 cam 0408+6220 11

1961 gx 11.5 cam 0542+6923 11

2655 gx 11.5 cam 0856+7813 31

129 oc 10.0 cas 0027+5957 01

136 oc 11.3 cas 0029+6115 01

185 gx 11.0 cas 0039+4820 03

225 oc 09.0 cas 0043+6147 01

278 gx 12.5 cas 0052+4733 03

381 oc 09.5 cas 0108+6135 01

436 oc 09.5 cas 0116+5849 01

457 oc 08.0 cas 0119+5820 01

559 oc 07.5 cas 0130+6318 01

637 oc 07.5 cas 0143+6400 01

654 oc 10.0 cas 0144+6153 01

659 oc 10.0 cas 0144+6042 01

663 oc 07.5 cas 0146+6115 01

1027 oc 07.5 cas 0243+6113 02  
7789 oc 09.5 cas 2357+5644 03  
7790 oc 07.0 cas 2358+6113 03

040 pn 10.2 cep 0010+7215 01  
6939 oc 10.0 cep 2031+6038 61  
6946 gx 10.5 cep 2035+6009 61  
7142 oc 10.0 cep 2146+6548 71  
7160 oc 06.5 cep 2154+6236 71  
7380 cn 09.0 cep 2247+5806 72  
7510 oc 09.5 cep 2312+6034 71

157 gx 11.5 cet 0035-0824 07  
246 pn 10.9 cet 0047-1207 07  
247 gx 10.0 cet 0047-2045 07  
584 gx 12.0 cet 0131-0651 06  
596 gx 12.5 cet 0133-0701 06  
615 gx 12.5 cet 0135-0719 06  
720 gx 11.5 cet 0153-1344 06  
779 gx 12.0 cet 2000-0558 06  
908 gx 11.0 cet 0223-2113 06  
936 gx 11.0 cet 0228-0109 04  
1022 gx 12.5 cet 0239-0640 06  
1052 gx 12.0 cet 0241-0815 06  
1055 gx 11.5 cet 0242+0026 04

2204 oc 09.5 cma 0616-1839 16  
2354 oc 09.0 cma 0714-2544 27  
2360 oc 09.0 cma 0719-1537 27  
2362 oc 04.0 cma 0719-2457 27

2775 gx 11.5 cnc 0910+0703 24

4147 gc 11.0 com 1210+1833 45/C  
4150 gx 12.5 com 1211+3025 32  
4203 gx 12.0 com 1215+3313 32  
4245 gx 12.5 com 1218+2937 32  
4251 gx 12.0 com 1218+2811 32  
4274 gx 11.5 com 1220+2937 32  
4278 gx 11.5 com 1220+2918 32  
4293 gx 11.5 com 1221+1824 45/C  
4314 gx 11.5 com 1223+2954 32  
4350 gx 12.0 com 1224+1642 45/C  
4394 gx 12.0 com 1226+1813 45/C  
4414 gx 11.5 com 1226+3114 32  
4419 gx 12.5 com 1227+1503 45/C  
4448 gx 12.0 com 1228+2838 32  
4450 gx 11.5 com 1229+1706 45/C  
4459 gx 12.0 com 1229+1359 45/C  
4473 gx 12.0 com 1230+1326 45/C  
4477 gx 11.5 com 1230+1339 45/C  
4494 gx 11.0 com 1231+2547 45  
4548 gx 11.5 com 1236+1430 45/C (m91)

4559 gx 10.5 com 1236+2758 32  
4565 gx 10.5 com 1236+2600 32  
4689 gx 12.0 com 1248+1346 45/C  
4725 gx 10.0 com 1250+2533 45

3962 gx 12.5 crt 1155-1358 36

4027 gx 12.0 crv 1200-1915 36  
4038 gx 10.5 crv 1202-1851 36  
4361 pn 11.0 crv 1225-1848 47

4111 gx 12.0 cvn 1207+4305 32  
4143 gx 12.5 cvn 1210+4233 32  
4151 gx 11.5 cvn 1211+3925 32  
4214 gx 10.5 cvn 1216+3620 32  
4258 gx 09.5 cvn 1219+4719 32 (m106)  
4346 gx 12.5 cvn 1223+4700 32  
4449 gx 10.5 cvn 1228+4406 32  
4485 gx 13.0 cvn 1231+4143 32  
4490 gx 11.0 cvn 1231+4139 32  
4618 gx 11.5 cvn 1242+4110 32  
4631 gx 10.0 cvn 1242+3233 32  
4656 gx 11.0 cvn 1244+3211 32  
4800 gx 13.0 cvn 1255+4632 32  
5005 gx 11.5 cvn 1311+3703 43  
5033 gx 10.5 cvn 1314+3636 43  
5195 gx 09.5 cvn 1330+4716 32 (m51)  
5273 gx 12.5 cvn 1342+3538 43

6826 pn 09.0 cyg 1945+5031 62  
6834 oc 10.0 cyg 1952+2925 62  
6866 oc 09.0 cyg 2004+4400 62  
6910 oc 07.5 cyg 2023+4047 62  
7000 dn 05.5 cyg 2102+4412 62  
7008 pn 13.5 cyg 2101+5433 62  
7044 oc 11.5 cyg 2113+4229 62  
7062 oc 11.5 cyg 2123+4623 62  
7086 oc 11.0 cyg 2131+5135 62  
7128 oc 11.5 cyg 2144+5343 62

6905 pn 12.0 del 2022+2006 64  
6934 gc 10.0 del 2034+2410 64  
7006 gc 11.5 del 2102+1611 64

3147 gx 12.0 dra 1017+7325 21  
5866 gx 11.5 dra 1507+5545 42 (m102)  
5907 gx 11.5 dra 1516+5619 42  
5982 gx 12.5 dra 1539+5921 42  
6543 pn 09.0 dra 1759+6638 51

1084 gx 12.0 eri 0246-0735 06  
1407 gx 12.0 eri 0340-1834 17  
1535 pn 10.5 eri 0414-1244 17

2129 oc 07.0 gem 0601+2318 14  
2158 oc 12.0 gem 0608+0612 14  
2266 oc 09.5 gem 0643+2658 23  
2304 oc 11.0 gem 0655+1801 25  
2355 oc 09.5 gem 0717+1347 25  
2371 pn 13.0 gem 0726+2929 23  
2372 pn 13.0 gem 0726+2930 23  
2392 pn 10.0 gem 0729+2055 25  
2395 oc 09.5 gem 0727+1335 25  
2403 gx 09.5 gem 0737+6537 21  
2420 oc 10.0 gem 0739+2134 25

6207 gx 12.5 her 1643+3650 52  
6229 gc 10.5 her 1647+4732 52

2548 oc 05.0 hya 0814-0548 26 (m48)  
2811 gx 13.0 hya 0916-1618 26  
3242 pn 10.0 hya 1025-1838 36  
3621 gx 10.0 hya 1118-3248 36  
5694 gc 11.0 hya 1440-2632 46

7209 oc 08.0 lac 2205+4630 73  
7243 oc 06.5 lac 2215+4953 73  
7296 oc 09.5 lac 2228+5217 73

2903 gx 10.0 leo 0932+2129 35  
2964 gx 12.5 leo 0943+3151 33  
3190 gx 12.0 leo 1018+2149 35  
3193 gx 12.5 leo 1019+2153 35  
3226 gx 12.5 leo 1024+1953 34  
3227 gx 12.0 leo 1024+1951 34  
3377 gx 11.5 leo 1048+1359 34  
3379 gx 11.0 leo 1048+1235 34 (m105)  
3384 gx 11.5 leo 1048+1238 34  
3412 gx 12.0 leo 1051+1324 34  
3489 gx 11.5 leo 1100+1354 34  
3521 gx 10.5 leo 1106+0002 34  
3593 gx 12.0 leo 1115+1249 34  
3607 gx 12.0 leo 1117+1804 34  
3608 gx 12.5 leo 1117+1810 34  
3626 gx 12.0 leo 1120+1822 34  
3628 gx 10.5 leo 1120+1336 34  
3640 gx 12.0 leo 1121+0315 34  
3655 gx 13.0 leo 1123+1636 34  
3686 gx 12.0 leo 1128+1714 34  
3810 gx 11.5 leo 1141+1129 34  
3900 gx 12.5 leo 1149+2702 34  
3912 gx 13.0 leo 1150+2629 34

1964 gx 11.5 lep 0533-2157 16

5897 gc 09.5 lib 1517-2101 46

2859 gx 12.0 lmi 0924+3432 22  
3245 gx 12.0 lmi 1027+2830 33  
3277 gx 13.0 lmi 1033+2830 33  
3294 gx 12.0 lmi 1036+3719 33  
3344 gx 11.5 lmi 1044+2455 34  
3395 gx 12.5 lmi 1050+3259 33  
3414 gx 12.0 lmi 1051+2758 34  
3432 gx 12.0 lmi 1053+3637 33  
3486 gx 11.0 lmi 1101+2859 33  
3504 gx 12.0 lmi 1102+2807 34

2419 gc 11.5 lyn 0738+3853 23  
2683 gx 11.0 lyn 0853+3325 22  
2782 gx 12.5 lyn 0914+4007 22

2185 dn 10.0 mon 0611-0612 16  
2215 oc 08.5 mon 0621-0717 27  
2232 oc 04.0 mon 0627-0445 27  
2244 cn 05.0 mon 0632+0452 25  
2251 oc 08.5 mon 0635+0822 25  
2264 cn 04.0 mon 0641+0953 25  
2286 oc 08.5 mon 0648-0310 25  
2301 oc 06.5 mon 0652+0028 25  
2311 oc 09.5 mon 0658-0435 27  
2324 oc 09.0 mon 0704+0103 25  
2335 oc 09.5 mon 0707-1005 27  
2343 oc 08.0 mon 0708-1039 27  
2353 oc 05.0 mon 0715-1018 27  
2506 oc 08.5 mon 0800-1047 26

6171 gc 10.0 oph 1633-1303 56 (m107)  
6235 gc 11.0 oph 1653-2211 56  
6284 gc 10.5 oph 1705-2446 56  
6287 gc 11.0 oph 1705-2242 56  
6293 gc 09.5 oph 1710-2635 56  
6304 gc 10.0 oph 1715-2928 56  
6316 gc 10.0 oph 1717-2808 56  
6342 gc 11.5 oph 1721-1935 56  
6355 gc 09.5 oph 1724-2621 56  
6356 gc 09.5 oph 1724-1749 56  
6369 pn 14.0 oph 1729-2346 56  
6401 gc 07.5 oph 1739-2355 56  
6426 gc 12.5 oph 1744+0300 54  
6517 gc 13.0 oph 1802-0858 67  
6633 oc 05.5 oph 1828-0634 65

1788 dn 09.0 ori 0507-0320 16  
1980 cn 02.5 ori 0535-0555 16/B  
1999 dn 10.0 ori 0537-0643 16  
2022 pn 13.0 ori 0537-0643 14  
2024 dn 10.0 ori 0542-0150 16

2169 oc 07.0 ori 0608+1357 14  
2186 oc 09.0 ori 0612+0527 14  
2194 oc 10.5 ori 0614+1248 14

7217 gx 11.5 peg 2208+3121 73  
7331 gx 10.5 peg 2237+3426 72  
7448 gx 12.5 peg 2300+1559 74  
7479 gx 11.5 peg 2305+1219 74  
7814 gx 12.0 peg 0005+1608 74

651 pn 12.0 per 0142+5134 02 (m76)  
869 oc 04.5 per 0219+5709 02  
884 oc 04.5 per 0222+5707 02  
1023 gx 11.0 per 0241+3903 02  
1245 oc 09.0 per 0315+4715 02  
1342 oc 07.0 per 0332+3720 02  
1444 oc 06.5 per 0349+5240 02  
1513 oc 09.0 per 0410+4931 13  
1528 oc 06.5 per 0415+5114 13  
1545 oc 08.0 per 0421+5015 13

488 gx 11.5 psc 0122+0516 05  
524 gx 12.0 psc 0125+0933 05

2421 oc 09.0 pup 0736-2037 26  
2422 oc 04.5 pup 0737-1430 26 (m47)  
2423 oc 07.0 pup 0737-1352 26  
2438 pn 11.5 pup 0742-1444 26  
2440 pn 11.5 pup 0742-1813 26  
2479 oc 09.6 pup 0755-1743 26  
2482 oc 08.5 pup 0755-2418 26  
2489 oc 09.5 pup 0756-3004 26  
2509 oc 09.5 pup 0801-1904 26  
2527 oc 08.0 pup 0805-2810 26  
2539 oc 08.0 pup 0810-1250 26  
2567 oc 08.5 pup 0818-3038 26  
2571 oc 07.5 pup 0819-2944 26

2613 gx 11.0 pyx 0833-2258 26  
2627 oc 08.5 pyx 0837-2957 26

253 gx 07.5 scl 0048-2518 07  
288 gc 09.0 scl 0053-2635 07  
613 gx 11.0 scl 0134-2924 06

6144 gc 11.0 sco 1627-2602 56  
6451 oc 08.5 sco 1751-3013 58

6664 oc 09.0 sct 1837-0813 67  
6712 gc 10.0 sct 1853-0842 67

6118 gx 12.0 ser 1622-0217 54

2974 gx 12.5 sex 0943-0343 37  
3115 gx 10.5 sex 1005-0742 37  
3166 gx 11.5 sex 1014+0326 35  
3169 gx 11.5 sex 1014+0329 35

6440 gc 12.0 sgr 1749-2022 67  
6445 pn 13.0 sgr 1749-2001 67  
6514 cn 05.0 sgr 1802-2302 67 (m20)  
6520 oc 07.5 sgr 1803-2754 67  
6522 gc 10.5 sgr 1804-3002 67  
6528 gc 11.0 sgr 1805-3003 67  
6540 oc 14.0 sgr 1806-2749 67  
6544 gc 07.5 sgr 1807-2500 67  
6553 gc 10.0 sgr 1809-2554 67  
6568 oc 08.5 sgr 1813-2136 67  
6569 gc 10.5 sgr 1814-3150 67  
6583 oc 12.0 sgr 1816-2208 67  
6624 gc 09.5 sgr 1824-3022 67  
6629 pn 12.0 sgr 1826-2312 67  
6638 gc 10.0 sgr 1831-2530 67  
6642 gc 10.5 sgr 1832-2329 67  
6645 oc 08.5 sgr 1833-1654 67  
6818 pn 10.0 sgr 1944-1409 66

1647 oc 06.0 tau 0446+1904 15  
1817 oc 08.0 tau 0512+1642 14

598 gx 07.0 tri 0134+3040 02 (m33)

2681 gx 11.5 uma 0854+5118 22  
2742 gx 12.5 uma 0908+6029 31  
2768 gx 12.0 uma 0912+6003 31  
2787 gx 12.0 uma 0919+6913 21  
2841 gx 10.5 uma 0922+5059 22  
2950 gx 12.5 uma 0943+5851 31  
2976 gx 11.5 uma 0947+6755 31  
2985 gx 11.5 uma 0950+7217 21  
3034 gx 09.5 uma 0956+6941 31 (m82)  
3077 gx 11.5 uma 1003+6845 31  
3079 gx 12.0 uma 1002+5541 22  
3184 gx 11.0 uma 1018+4125 33  
3198 gx 11.0 uma 1020+4532 33  
3310 gx 11.5 uma 1039+5330 33  
3556 gx 11.0 uma 1112+5541 43 (m108)  
3610 gx 12.0 uma 1118+5848 31  
3613 gx 12.0 uma 1119+5800 31  
3619 gx 12.5 uma 1119+5746 31  
3631 gx 11.5 uma 1121+5311 32  
3665 gx 12.5 uma 1123+3854 32  
3675 gx 11.5 uma 1126+4336 32  
3726 gx 11.0 uma 1133+4702 32  
3729 gx 13.0 uma 1134+5308 32  
3813 gx 13.0 uma 1141+3633 32

3877 gx 12.0 uma 1146+4730 32  
3893 gx 11.5 uma 1149+4843 32  
3898 gx 11.5 uma 1149+5606 32  
3938 gx 11.0 uma 1153+4408 32  
3941 gx 11.5 uma 1153+3700 32  
3945 gx 12.0 uma 1153+6041 31  
3949 gx 12.0 uma 1154+4752 32  
3953 gx 11.0 uma 1154+5220 32  
3982 gx 12.5 uma 1157+5508 32  
3992 gx 10.5 uma 1158+5323 32 (m109)  
3998 gx 12.0 uma 1158+5528 32  
4026 gx 12.0 uma 1159+5058 32  
4036 gx 12.0 uma 1202+6154 31  
4041 gx 12.0 uma 1202+6209 31  
4051 gx 11.5 uma 1204+4433 32  
4085 gx 13.0 uma 1205+5022 32  
4088 gx 11.5 uma 1206+5033 32  
4102 gx 12.5 uma 1207+5243 32  
5322 gx 11.5 uma 1349+6012 32  
5473 gx 13.0 uma 1405+5454 42  
5474 gx 11.5 uma 1405+5340 42  
5631 gx 12.5 uma 1427+5634 41

6217 gx 12.5 umi 1633+7812 41

4030 gx 11.5 vir 1200-0105 36  
4179 gx 12.0 vir 1213+0119 45  
4216 gx 11.0 vir 1216+1309 45/C  
4261 gx 11.5 vir 1219+0550 45  
4273 gx 12.5 vir 1220+0521 45  
4281 gx 12.5 vir 1220+0524 45  
4303 gx 10.5 vir 1222+0429 45 (m61)  
4365 gx 11.0 vir 1225+0720 45/C  
4371 gx 12.0 vir 1225+1143 45/C  
4429 gx 11.5 vir 1228+1107 45/C  
4435 gx 12.0 vir 1228+1305 45/C  
4438 gx 11.0 vir 1228+1301 45/C  
4442 gx 11.5 vir 1228+0949 45/C  
4478 gx 12.5 vir 1230+1220 45/C  
4526 gx 11.0 vir 1234+0743 45/C  
4527 gx 11.5 vir 1234+0240 45  
4535 gx 11.0 vir 1234+0813 45/C  
4536 gx 11.0 vir 1235+0212 45  
4546 gx 12.0 vir 1236-0347 45  
4550 gx 12.5 vir 1236+1214 45/C  
4570 gx 12.0 vir 1237+0715 45/C  
4594 gx 09.5 vir 1240-1137 47 (m104)  
4596 gx 12.0 vir 1240+1011 45/C  
4636 gx 11.0 vir 1243+0242 45  
4643 gx 12.0 vir 1243+0159 45  
4654 gx 11.5 vir 1244+1308 45/C  
4660 gx 12.5 vir 1246+1112 45/C



4665 gx 11.5 vir 1245+0304 45  
4666 gx 11.5 vir 1245-0027 45  
4697 gx 10.5 vir 1249-0548 45  
4698 gx 12.0 vir 1249+0830 45/C  
4699 gx 11.0 vir 1249-0840 47  
4753 gx 11.0 vir 1252-0112 45  
4754 gx 12.0 vir 1252+1119 45/C  
4762 gx 11.5 vir 1253+1114 45/C  
4781 gx 12.0 vir 1254-1032 47  
4845 gx 12.5 vir 1258+0135 45  
4856 gx 11.5 vir 1259-1502 47  
4866 gx 12.0 vir 1259+1410 45/C  
4900 gx 12.0 vir 1301+3012 45  
4958 gx 12.0 vir 1306-0801 47  
4995 gx 12.0 vir 1310-0750 47  
5054 gx 11.5 vir 1317-1639 47  
5363 gx 11.5 vir 1356+0516 44  
5364 gx 11.0 vir 1356+0502 44  
5566 gx 11.5 vir 1420+0356 44  
5576 gx 12.0 vir 1421+0316 44  
5634 gc 11.0 vir 1430-0559 44  
5746 gx 11.5 vir 1445+0149 44  
5846 gx 11.5 vir 1507+0136 46

6802 oc 09.0 vul 1931+2016 64  
6823 cn 10.0 vul 1943+2318 62  
6830 oc 09.0 vul 1951+2304 62  
6882 oc 05.5 vul 2012+2633 62  
6885 oc 09.0 vul 2012+2629 62  
6940 oc 06.5 vul 2035+2818 62

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NGC typ /mag / con / radec / psa

2655 gx 11.5 cam 0856+7813 31  
6217 gx 12.5 umi 1633+7812 41  
3147 gx 12.0 dra 1017+7325 21  
2985 gx 11.5 uma 0950+7217 21  
040 pn 10.2 cep 0010+7215 01 (c2)  
3034 gx 09.5 uma 0956+6941 31 (m82)  
1961 gx 11.5 cam 0542+6923 11  
2787 gx 12.0 uma 0919+6913 21  
3077 gx 11.5 uma 1003+6845 31  
2976 gx 11.5 uma 0947+6755 31  
6543 pn 09.0 dra 1759+6638 51 (c6)  
7142 oc 10.0 cep 2146+6548 71  
2403 gx 09.5 gem 0737+6537 21 (c7)  
637 oc 07.5 cas 0143+6400 01  
559 oc 07.5 cas 0130+6318 01 (c8)  
7160 oc 06.5 cep 2154+6236 71  
1502 oc 05.5 cam 0408+6220 11  
4041 gx 12.0 uma 1202+6209 31

4036 gx 12.0 uma 1202+6154 31  
654 oc 10.0 cas 0144+6153 01  
225 oc 09.0 cas 0043+6147 01  
1027 oc 07.5 cas 0243+6138 02  
381 oc 09.5 cas 0108+6135 01  
136 oc 11.3 cas 0029+6132 01  
663 oc 07.5 cas 0146+6114 01 (c10)  
7790 oc 07.0 cas 2358+6112 03  
1501 pn 13.5 cam 0407+6055 11  
659 oc 10.0 cas 0144+6042 01  
3945 gx 12.0 uma 1153+6041 31  
6939 oc 10.0 cep 2031+6038 61  
7510 oc 09.5 cep 2312+6034 71  
2742 gx 12.5 uma 0908+6029 31  
5322 gx 11.5 uma 1349+6012 32  
6946 gx 10.5 cep 2035+6009 61 (c12)  
2768 gx 12.0 uma 0912+6003 31  
129 oc 10.0 cas 0027+5957 01  
5982 gx 12.5 dra 1539+5921 42  
2950 gx 12.5 uma 0943+5851 31  
436 oc 09.5 cas 0116+5849 01  
3610 gx 12.0 uma 1118+5848 31  
457 oc 08.0 cas 0119+5820 01 (c13)  
7380 cn 09.0 cep 2247+5806 72  
3613 gx 12.0 uma 1119+5800 31  
3619 gx 12.5 uma 1119+5746 31  
869 oc 04.5 per 0219+5709 02 (c14)  
884 oc 04.5 per 0222+5707 02 (c14a)  
7789 oc 09.5 cas 2357+5644 03  
5631 gx 12.5 uma 1427+5634 41  
5907 gx 11.5 dra 1516+5619 42  
3898 gx 11.5 uma 1149+5606 32  
5866 gx 11.5 dra 1507+5545 42 (m102)  
3079 gx 12.0 uma 1002+5541 22  
3556 gx 11.0 uma 1112+5540 43 (m108)  
3998 gx 12.0 uma 1158+5528 32  
3982 gx 12.5 uma 1157+5508 32  
5473 gx 13.0 uma 1405+5454 42  
7008 pn 13.5 cyg 2101+5433 62  
7128 oc 11.5 cyg 2144+5343 62  
5474 gx 11.5 uma 1405+5340 42  
3310 gx 11.5 uma 1039+5330 33  
3992 gx 10.5 uma 1158+5323 32 (m109)  
3631 gx 11.5 uma 1121+5311 32  
3729 gx 13.0 uma 1134+5308 32  
4102 gx 12.5 uma 1207+5243 32  
1444 oc 06.5 per 0349+5240 02  
3953 gx 11.0 uma 1154+5220 32  
7296 oc 09.5 lac 2228+5217 73  
7086 oc 11.0 cyg 2131+5135 62  
651 pn 12.0 per 0142+5134 02 (m76)  
2681 gx 11.5 uma 0854+5118 22

1528 oc 06.5 per 0415+5114 13  
2841 gx 10.5 uma 0922+5059 22  
4026 gx 12.0 uma 1159+5058 32  
4088 gx 11.5 uma 1206+5033 32  
6826 pn 09.0 cyg 1945+5031 62 (c15)  
4085 gx 13.0 uma 1205+5022 32  
1545 oc 08.0 per 0421+5015 13  
2126 oc 10.0 aur 0603+4954 12  
7243 oc 06.5 lac 2215+4953 73 (c16)  
1513 oc 09.0 per 0410+4931 13  
5676 gx 12.0 boo 1433+4927 42  
7686 oc 08.0 and 2330+4908 03  
5689 gx 12.5 boo 1436+4844 42  
3893 gx 11.5 uma 1149+4843 32  
185 gx 11.0 cas 0039+4820 03 (c18)  
3949 gx 12.0 uma 1154+4752 32  
278 gx 12.5 cas 0052+4733 03  
6229 gc 10.5 her 1647+4732 52  
3877 gx 12.0 uma 1146+4730 32  
4258 gx 09.5 cvn 1219+4719 32 (m106)  
5195 gx 09.5 cvn 1330+4716 32 (m51)  
1245 oc 09.0 per 0315+4715 02  
3726 gx 11.0 uma 1133+4702 32  
4346 gx 12.5 cvn 1223+4700 32  
4800 gx 13.0 cvn 1255+4632 32  
7209 oc 08.0 lac 2205+4630 73  
7062 oc 11.5 cyg 2123+4623 62  
3198 gx 11.0 uma 1020+4532 33  
4051 gx 11.5 uma 1204+4433 32  
7000 dn 05.5 cyg 2102+4412 62 (c20)  
3938 gx 11.0 uma 1153+4408 32  
4449 gx 10.5 cvn 1228+4406 32 (c21)  
6866 oc 09.0 cyg 2004+4400 62  
1664 oc 08.0 aur 0451+4342 12  
3675 gx 11.5 uma 1126+4336 32  
4111 gx 12.0 cvn 1207+4305 32  
7662 pn 09.0 and 2326+4232 03 (c22)  
4143 gx 12.5 cvn 1210+4232 32  
7044 oc 11.5 cyg 2113+4229 62  
891 gx 11.5 and 0223+4221 02 (c23)  
4485 gx 13.0 cvn 1231+4143 32  
205 gx 10.0 and 0040+4141 03 (m110)  
4490 gx 11.0 cvn 1231+4139 32  
3184 gx 11.0 uma 1018+4125 33  
4618 gx 11.5 cvn 1242+4110 32  
2281 oc 07.0 aur 0649+4104 23  
6910 oc 07.5 cyg 2023+4047 62  
2782 gx 12.5 lyn 0914+4007 22  
4151 gx 11.5 cvn 1211+3925 32  
1857 oc 08.5 aur 0520+3921 12  
1023 gx 11.0 per 0241+3903 02  
3665 gx 12.5 uma 1123+3854 32

2419 gc 11.5 lyn 0738+3853 23 (c25)  
752 oc 06.5 and 0158+3741 02 (c28)  
1342 oc 07.0 per 0332+3720 02  
3294 gx 12.0 lmi 1036+3719 33  
5005 gx 11.5 cvn 1311+3703 43 (c29)  
3941 gx 11.5 uma 1153+3700 32  
6207 gx 12.5 her 1643+3650 52  
3432 gx 12.0 lmi 1053+3637 33  
5033 gx 10.5 cvn 1314+3636 43  
3813 gx 13.0 uma 1141+3633 32  
5557 gx 13.0 boo 1418+3629 42  
4214 gx 10.5 cvn 1216+3620 32  
404 gx 12.0 and 0110+3543 03  
5273 gx 12.5 cvn 1342+3538 43  
1907 oc 10.5 aur 0528+3519 12  
2859 gx 12.0 lmi 0924+3432 22  
7331 gx 10.5 peg 2237+3426 72 (c30)  
1931 cn 13.0 aur 0531+3415 12  
2683 gx 11.0 lyn 0853+3325 22  
4203 gx 12.0 com 1215+3313 32  
3395 gx 12.5 lmi 1050+3259 33  
4631 gx 10.0 cvn 1242+3233 32 (c32)  
4656 gx 11.0 cvn 1244+3211 32  
2964 gx 12.5 leo 0943+3151 33  
7217 gx 11.5 peg 2208+3121 73  
4414 gx 11.5 com 1226+3114 32  
598 gx 07.0 tri 0134+3040 02 (m33)  
4150 gx 12.5 com 1211+3025 32  
4900 gx 12.0 vir 1301+3012 45  
4314 gx 11.5 com 1223+2954 32  
4274 gx 11.5 com 1220+2937 32  
4245 gx 12.5 com 1218+2936 32  
2372 pn 13.0 gem 0726+2930 23  
2371 pn 13.0 gem 0726+2929 23  
6834 oc 10.0 cyg 1952+2925 62  
4278 gx 11.5 com 1220+2918 32  
3486 gx 11.0 lmi 1101+2859 33  
4448 gx 12.0 com 1228+2838 32  
5466 gc 10.5 boo 1406+2832 44  
3277 gx 13.0 lmi 1033+2831 33  
3245 gx 12.0 lmi 1027+2830 33  
6940 oc 06.5 vul 2035+2818 62  
4251 gx 12.0 com 1218+2811 32  
3504 gx 12.0 lmi 1102+2807 34  
3414 gx 12.0 lmi 1051+2759 34  
4559 gx 10.5 com 1236+2758 32 (c36)  
3900 gx 12.5 leo 1149+2702 34  
2266 oc 09.5 gem 0643+2658 23  
6882 oc 05.5 vul 2012+2633 62  
3912 gx 13.0 leo 1150+2629 34  
6885 oc 09.0 vul 2012+2629 62 (c37)  
4565 gx 10.5 com 1236+2600 32 (c38)

4494 gx 11.0 com 1231+2547 45  
4725 gx 10.0 com 1250+2533 45  
3344 gx 11.5 lmi 1044+2455 34  
6934 gc 10.0 del 2034+2410 64  
2129 oc 07.0 gem 0601+2319 14  
6823 cn 10.0 vul 1943+2318 62  
6830 oc 09.0 vul 1951+2304 62  
3193 gx 12.5 leo 1019+2153 35  
3190 gx 12.0 leo 1018+2149 35  
2420 oc 10.0 gem 0739+2134 25  
2903 gx 10.0 leo 0932+2129 35  
2392 pn 10.0 gem 0729+2055 25 (c39)  
6802 oc 09.0 vul 1931+2016 64  
6905 pn 12.0 del 2022+2006 64  
3226 gx 12.5 leo 1024+1953 34  
3227 gx 12.0 leo 1024+1951 34  
1647 oc 06.0 tau 0446+1904 15  
772 gx 11.5 ari 0159+1900 04  
4147 gc 11.0 com 1210+1833 45/C  
4293 gx 11.5 com 1221+1824 45/C  
3626 gx 12.0 leo 1120+1822 34 (c40)  
4394 gx 12.0 com 1226+1813 45/C  
3608 gx 12.5 leo 1117+1810 34  
3607 gx 12.0 leo 1117+1804 34  
2304 oc 11.0 gem 0655+1801 25  
3686 gx 12.0 leo 1128+1714 34  
4450 gx 11.5 com 1229+1706 45/C  
4350 gx 12.0 com 1224+1642 45/C  
1817 oc 08.0 tau 0512+1641 14  
3655 gx 13.0 leo 1123+1636 34  
7006 gc 11.5 del 2102+1611 64 (c42)  
7814 gx 12.0 peg 0005+1608 74 (c43)  
7448 gx 12.5 peg 2300+1559 74  
4419 gx 12.5 com 1227+1503 45/C  
4548 gx 11.5 com 1236+1430 45/C (m91)  
4866 gx 12.0 vir 1259+1410 45/C  
3377 gx 11.5 leo 1048+1359 34  
4459 gx 12.0 com 1229+1358 45/C  
2169 oc 07.0 ori 0608+1357 14  
3489 gx 11.5 leo 1100+1354 34  
2355 oc 09.5 gem 0717+1347 25  
4689 gx 12.0 com 1248+1346 45/C  
4477 gx 11.5 com 1230+1339 45/C  
3628 gx 10.5 leo 1120+1336 34  
2395 oc 09.5 gem 0727+1335 25  
4473 gx 12.0 com 1230+1326 45/C  
3412 gx 12.0 leo 1051+1324 34  
4216 gx 11.0 vir 1216+1309 45/C  
4654 gx 11.5 vir 1244+1308 45/C  
4435 gx 12.0 vir 1228+1305 45/C  
4438 gx 11.0 vir 1228+1301 45/C  
3593 gx 12.0 leo 1115+1249 34

2194 oc 10.5 ori 0614+1248 14  
3384 gx 11.5 leo 1048+1238 34  
3379 gx 11.0 leo 1048+1235 34 (m105)  
4478 gx 12.5 vir 1230+1220 45/C  
7479 gx 11.5 peg 2305+1219 74 (c44)  
4550 gx 12.5 vir 1236+1214 45/C  
4371 gx 12.0 vir 1225+1143 45/C  
3810 gx 11.5 leo 1141+1129 34  
4754 gx 12.0 vir 1252+1119 45/C  
4762 gx 11.5 vir 1253+1114 45/C  
4660 gx 12.5 vir 1246+1112 45/C  
4429 gx 11.5 vir 1228+1107 45/C  
4596 gx 12.0 vir 1240+1011 45/C  
2264 cn 04.0 mon 0641+0953 25  
4442 gx 11.5 vir 1228+0949 45/C  
524 gx 12.0 psc 0125+0933 05  
2022 pn 13.0 ori 0537+0905 14  
5248 gx 11.0 boo 1337+0853 44 (c45)  
4698 gx 12.0 vir 1249+0830 45/C  
2251 oc 08.5 mon 0635+0822 25  
4535 gx 11.0 vir 1234+0813 45/C  
4526 gx 11.0 vir 1234+0743 45/C  
4365 gx 11.0 vir 1225+0720 45/C  
4570 gx 12.0 vir 1237+0715 45/C  
2775 gx 11.5 cnc 0910+0703 24 (c48)  
6781 pn 12.5 aql 1919+0632 65  
2158 oc 12.0 gem 0608+0612 14  
4261 gx 11.5 vir 1219+0550 45  
2186 oc 09.0 ori 0612+0527 14  
4281 gx 12.5 vir 1220+0524 45  
4273 gx 12.5 vir 1220+0521 45  
488 gx 11.5 psc 0122+0515 05  
5363 gx 11.5 vir 1356+0515 44  
5364 gx 11.0 vir 1356+0502 44  
2244 cn 05.0 mon 0632+0452 25 (c50)  
6756 oc 10.5 aql 1909+0441 65  
4303 gx 10.5 vir 1222+0429 45 (m61)  
6755 oc 09.0 aql 1908+0414 65  
5566 gx 11.5 vir 1420+0356 44  
3169 gx 11.5 sex 1014+0329 35  
3166 gx 11.5 sex 1014+0326 35  
5576 gx 12.0 vir 1421+0316 44  
3640 gx 12.0 leo 1121+0315 34  
4665 gx 11.5 vir 1245+0304 45  
6426 gc 12.5 oph 1744+0300 54  
4636 gx 11.0 vir 1243+0242 45  
4527 gx 11.5 vir 1234+0240 45  
4536 gx 11.0 vir 1235+0212 45  
4643 gx 12.0 vir 1243+0159 45  
5746 gx 11.5 vir 1445+0149 44  
5846 gx 11.5 vir 1507+0136 46  
4845 gx 12.5 vir 1258+0135 45

4179 gx 12.0 vir 1213+0119 45  
2324 oc 09.0 mon 0704+0103 25  
2301 oc 06.5 mon 0652+0028 25  
1055 gx 11.5 cet 0242+0026 04  
3521 gx 10.5 leo 1106+0002 34  
4666 gx 11.5 vir 1245-0027 45  
4030 gx 11.5 vir 1200-0105 36  
936 gx 11.0 cet 0228-0109 04  
4753 gx 11.0 vir 1252-0112 45  
2024 dn 10.0 ori 0542-0150 16  
6118 gx 12.0 ser 1622-0217 54  
2286 oc 08.5 mon 0648-0310 25  
1788 dn 09.0 ori 0507-0320 16  
2974 gx 12.5 sex 0943-0343 37  
4546 gx 12.0 vir 1236-0347 45  
2311 oc 09.5 mon 0658-0435 27  
2232 oc 04.0 mon 0627-0445 27  
2548 oc 05.0 hya 0814-0545 26 (m48)  
4697 gx 10.5 vir 1249-0548 45 (c52)  
1980 cn 02.5 ori 0535-0555 16/B  
779 gx 12.0 cet 2000-0558 06  
5634 gc 11.0 vir 1430-0559 44  
2185 dn 10.0 mon 0611-0612 16  
6633 oc 05.5 oph 1828-0634 65  
1022 gx 12.5 cet 0239-0640 06  
1999 dn 10.0 ori 0537-0643 16  
584 gx 12.0 cet 0131-0651 06  
596 gx 12.5 cet 0133-0701 06  
2215 oc 08.5 mon 0621-0717 27  
615 gx 12.5 cet 0135-0719 06  
1084 gx 12.0 eri 0246-0735 06  
3115 gx 10.5 sex 1005-0742 37 (c53)  
4995 gx 12.0 vir 1310-0750 47  
4958 gx 12.0 vir 1306-0801 47  
6664 oc 09.0 sct 1837-0813 67  
1052 gx 12.0 cet 0241-0815 06  
157 gx 11.5 cet 0035-0824 07  
7606 gx 11.5 aqr 2319-0830 76  
4699 gx 11.0 vir 1249-0840 47  
6712 gc 10.0 sct 1853-0842 67  
6517 gc 13.0 oph 1802-0858 67  
2335 oc 09.5 mon 0707-1005 27  
2353 oc 05.0 mon 0715-1018 27  
4781 gx 12.0 vir 1254-1032 47  
2343 oc 08.0 mon 0708-1039 27  
2506 oc 08.5 mon 0800-1047 26 (c54)  
7009 pn 08.5 aqr 2104-1122 77 (c55)  
4594 gx 09.5 vir 1240-1137 47 (m104)  
246 pn 10.9 cet 0047-1207 07 (c56)  
7727 gx 11.5 aqr 2340-1218 76  
1535 pn 10.5 eri 0414-1244 17  
2539 oc 08.0 pup 0810-1250 26

7723 gx 12.0 aqr 2339-1258 76  
6171 gc 10.0 oph 1633-1303 56 (m107)  
720 gx 11.5 cet 0153-1344 06  
2423 oc 07.0 pup 0737-1352 26  
3962 gx 12.5 crt 1155-1358 36  
6818 pn 10.0 sgr 1944-1409 66  
2422 oc 04.5 pup 0737-1430 26 (m47)  
2438 pn 11.5 pup 0742-1444 26  
4856 gx 11.5 vir 1259-1502 47  
2360 oc 09.0 cma 0719-1537 27 (c58)  
2811 gx 13.0 hya 0916-1618 26  
5054 gx 11.5 vir 1317-1639 47  
6645 oc 08.5 sgr 1833-1654 67  
2479 oc 09.6 pup 0755-1743 26  
6356 gc 09.5 oph 1724-1749 56  
2440 pn 11.5 pup 0742-1813 26  
1407 gx 12.0 eri 0340-1834 17  
3242 pn 10.0 hya 1025-1838 36 (c59)  
2204 oc 09.5 cma 0616-1839 16  
4361 pn 11.0 crv 1225-1848 47  
4038/9 gx 10.5 crv 1202-1851 36 (c60/61)  
2509 oc 09.5 pup 0801-1904 26  
4027 gx 12.0 crv 1200-1915 36  
6342 gc 11.5 oph 1721-1935 56  
6445 pn 13.0 sgr 1749-2001 67  
6440 gc 12.0 sgr 1749-2022 67  
2421 oc 09.0 pup 0736-2037 26  
247 gx 10.0 cet 0047-2045 07 (c62)  
5897 gc 09.5 lib 1517-2101 46  
908 gx 11.0 cet 0223-2113 06  
6568 oc 08.5 sgr 1813-2136 67  
1964 gx 11.5 lep 0533-2157 16  
6583 oc 12.0 sgr 1816-2208 67  
6235 gc 11.0 oph 1653-2211 56  
6287 gc 11.0 oph 1705-2242 56  
2613 gx 11.0 pyx 0833-2258 26  
6514 cn 05.0 sgr 1802-2302 67 (m20)  
6629 pn 12.0 sgr 1826-2312 67  
6642 gc 10.5 sgr 1832-2329 67  
6369 pn 14.0 oph 1729-2346 56  
6401 gc 07.5 oph 1739-2355 56  
2482 oc 08.5 pup 0755-2418 26  
6284 gc 10.5 oph 1705-2446 56  
2362 oc 04.0 cma 0719-2457 27 (c64)  
6544 gc 07.5 sgr 1807-2500 67  
253 gx 07.5 scl 0048-2518 07 (c65)  
6638 gc 10.0 sgr 1831-2530 67  
2354 oc 09.0 cma 0714-2544 27  
6553 gc 10.0 sgr 1809-2554 67  
6144 gc 11.0 sco 1627-2602 56  
6355 gc 09.5 oph 1724-2621 56  
5694 gc 11.0 hya 1440-2632 46 (c66)



6293 gc 09.5 oph 1710-2635 56  
288 gc 09.0 scl 0053-2635 07  
6540 oc 14.0 sgr 1806-2749 67  
6520 oc 07.5 sgr 1803-2754 67  
6316 gc 10.0 oph 1717-2808 56  
2527 oc 08.0 pup 0805-2810 26  
613 gx 11.0 scl 0134-2924 06  
6304 gc 10.0 oph 1715-2928 56  
2571 oc 07.5 pup 0819-2944 26  
2627 oc 08.5 pyx 0837-2957 26  
6522 gc 10.5 sgr 1804-3002 67  
6528 gc 11.0 sgr 1805-3003 67  
2489 oc 09.5 pup 0756-3004 26  
6451 oc 08.5 sco 1751-3013 58  
6624 gc 09.5 sgr 1824-3022 67  
2567 oc 08.5 pup 0818-3038 26  
6569 gc 10.5 sgr 1814-3150 67  
3621 gx 10.0 hya 1118-3248 36

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\*\*\*\*\*

Tags: [astronomy](#), [moon](#), [saber](#), [saber's beads](#), [stargazing](#)

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# C14 Is Awesome!

## Saber Does The Stars (Vol 2: the Index Catalog)



*C14 (ngc869/884) in Perseus \*courtesy of SDSS\**

*[stephen saber/2004-2024/all contents within are free use and may be reprinted with author/website acknowledgement]*

*saber does the stars (vol. 1)*

*<http://saberdoesthestars.wordpress.com>*

*quick and dirty pov astro-sims*

*<http://www.youtube.com/@saberzastrovidz>*

*concordiem borealis*

*stephen saber's concordiem borealis*

*contact via messenger*

*<http://www.facebook.com/saberdrumz>*

\*\*\*\*\*

### **lucky ned pepper: steadiest hands in the west**

**we've all laughed or cringed at inaccurate or impossible telescope/binocular use in movies or tv. the near-omnipresent twin bino fieldstops, ellie watching a meteor shower thru a small mounted scope in *contact*, costner's first reaction looking thru azeem's makeshift pre-galilean scope in *robin hood*, ad nauseum.**

**for me, the most impressive has been lucky ned's handheld sharpshooting talent in the 2010 remake of *true grit*. at one point he casually brings a thin 16" spyglass to his eye- with one hand- and from at least a half-mile immediately sights rooster cogburn perfectly centered and focused with a steadiness that would embarrass the rock of gibraltar. ned later twirls the slim tube like a drumstick as an encore.**

**p.s., two more similar nok-fails within 8 hours of the above post.**

***the rifleman, s1e26*: mark brings a binocular to his eyes objectives-first. rather than reshoot the scene, an i-dream-of-jeannie-blink-esque edit magically flips the nok 180deg in his hands. pretty impressive adaptive optics for the old west.**

**madison's first binocular experience in *zombieland: double tap* is only forgivable cuz she's just so cute.**

**by the way, let me know if there's a central online vault for portrayed optics fails. i've got plenty more.**

\*\*\*\*\*

### c20: north america nebula naked-eye

despite the 4th mag brightness optimism, caldwell 20 (aka n.g.c. #7000) requires both very transparent and steady dark skies to reveal itself at 1x. my first naked-eye view of the fuzzy continent was one of many 'double-take' moments from repeated observing; like the first time seeing obvious red in m42, or noticing your shadow being cast by venus' light alone.

\*\*\*\*\*

### mercury is the closest planet to earth

roughly 46% of the time. venus 37%. mars 17%. mercury is actually the overall closest to all other solar system planets. most people have been indoctrinated by all those tidy inferior-conjunctions-in-a-row school posters. but that's only one aspect of many. this information will befuddle or bewilder most civilians.

\*\*\*\*\*

### my first saturn-versary

at the time of this post, saturn is back among the stars where i first laid glass on it as a serious observer 29 1/2 years ago- a much more visceral, celebratory milestone for me than the upcoming 30 years in by the calendar. i've felt the same pleasing deja-vu at 12 and 24 years with jupiter back in its 'original' starfield, and with other rare repeated sky events as well.

if you've had similar experiences, let's just say you've come to the right blog.

\*\*\*\*\*

### doublestars: a few laps with porrima (video):

<https://youtu.be/obgptdE5xhk>

\*\*\*\*\*

### that time i broke an a.i. obs program rule

it's generally frowned upon to log targets for multiple programs at once. but hey, how many chances does a yankee get to visit the amazing skies below the equator?

link: southern sky program mash-up

\*\*\*\*\*

### girls gone wild in taurus

every 8 years orbital resonance allows us to observe venus pass through the fabulous open cluster messier 45 (aka the pleiades), the brightest of these stars commonly known as the seven sisters. but what most astronomy books exclude is what a bad influence the promiscuous vixen venus has on the prim and proper pleiad ladies. april 2020's slumber party started off innocently enough, with venus tugging ally's braid but soon devolved into pillow fights, jello shots, and trashing hotel rooms, along with smoking cigars and gambling til sunrise. as usual, poor papa atlas ends up spending

the next day bailing his daughters out of jail and nursing hangovers, as venus happily prances along in search of others to partake in another night of hedonism. just some fractured mythology to keep in mind as we view m45 until april 4th 2028, when visiting venus again turns the stately cluster into a den of iniquities.

\*\*\*\*\*

toes fetish

that's transits, occultations, eclipses, and shadows. fans can enjoy some quick and dirty astro simulations of these events viewed from other locations in the solar system at <http://www.youtube.com/@saberzastrovidz>

\*\*\*\*\*

snl skit: more caldwell! (er, cowbell)

nasa/hubble's 2020 canonization of c-numbers as primary identifiers was certainly cause for celebration among the growing army of gen c-ers.

all that's left is to update the starmap ids in the next printings (or epoch). to this end i've started an email writing campaign to all the publishers, and encourage other caldwell fans to do the same.

to get a head start i've also bought 100 copies of both SA2000 and the Pocket Sky Atlas, whited-out the old ngcs, replaced them with the proper caldwell ids, and am reselling them as used at a discount.

let me know if you run across any saberized collector's editions.

\*\*\*\*\*

pass them a napkin

sir patrick was obviously a humble deepsky expert as well as a moon guy. consider that he created the caldwell catalogue on a napkin at dinner one night- from memory.

109 objects, constellations, mags, radecs, etc. ask one of the wannabe forum fuzzy 'experts' to attempt the same and all you'll get are sour grapes and tears.

sir patrick wasn't just a dso enthusiast, he was a freaking ninja.

\*\*\*\*\*

messier marathons are about to get a lot easier

well, eventually anyway. we're currently near the farthest northern point of earth's circle of precession.

in about 14,000 years vega will be our brightest 'north star'. for an observer at 45° n, polaris will scrape the horizon and *all* of the southern sky will be available- like observing from the equator now.

the nights that a marathon is *not* possible will be the minority, and our lucky descendants will also enjoy access to the entire caldwell catalogue treasures.

\*\*\*\*\*

skytimes astro-interview (part one)

st: so how does a deepsky guy end up with a lunar outreach term? i thought you guys hated the moon.

saber: not the skinny ones (moons not guys). and that's when dso hunters hit their stride- during the nights surrounding new moon. i got into the habit of searching for the very young crescents after sunset while waiting for the sky to darken. before long

i'd also be staying on the field til dawn just to chase the oldest slivers up from the horizon.

st: posts to the contrary, you're actually just a passive caldwell fan, and only became an advocate to keep the controversy/outreach going, and to avenge the enthusiastic noobs using c-numbers that were shamed out of forums by trolls not worthy of cleaning the british icon's monocle.

saber: all true.

st: rumor has it you got into observing because a girlfriend didn't want you going to stripclubs after band gigs.

saber: pretty selfish of her wasn't it?

st: so you bought her a \$39 novelty star after visiting the adler planetarium and ended up spending \$1000 to hunt it down and see it for yourself.

saber: yup. the kicker is she was so clueless that when we left the adler she was very suprised, having thought we were going to a 'plantarium'. she was expecting to see rows of vegetation.

but then, 30 years ago i never planned on becoming an infamous outreach promoter, either. still, everything i've tried to contribute has been done out of passion- to pay it forward- hopefully making the night sky that much more interesting, accessible, and even fun.

\*\*\*\*\*

beetlejuice behaving badly

as of mid-feb 2020, i give bellatrix at least a couple tenths of magnitude over betelgeuse.

in the same binocular field bella is slightly more obvious at dusk, and defocusing the pair in a dark sky reveals the difference as well.

also, having recovered from my initial shock at the red-orange giant's dramatic dimming,

i now just want it to finally stop teasing us and explode in a historic blaze of glory.

and poor rigel. the jan brady of orion. betelgeuse gets uglified-up by a football to the face- but steals even more attention. (marsha, marsha, marsha!)

enjoying the show,

stephen

[betelgeuse supernova simulation: <https://youtu.be/hJPVuSNFxIY> ]

messier-caldwell (mescal) marathon

\*\*\*\*\*

for several years i've been adding all the available caldwells in the constellations i'm passing through to my standard messier sequence. there's just too many great treasures within a stone's throw to pass up. many can be hunted during the halftime break or while gambling on m30 as well:

<https://messiercaldwellmarathon.blogspot.com>

\*\*\*\*\*

23238 ocasio-cortez

i had a crush on aoc already, but finding out that she also has an asteroid named for her somehow has me even more smitten. i'm not sure why. i don't agree with her views. the rock's name was probably just a diversity gift (she got it for placing 2nd in a high school science fair). still, i feel an increased bond with her because of it. weird, huh? anyway, occasional

cortex's rock is 1.5 miles in diameter and orbits in the main asteroid belt between mars and jupiter.

\* \* \* \* \*

public forgiveness (cont.)

my friend cozi explains floaters:

<https://m.youtube.com/watch?v=TzLvWjfCTBc>

\*\*\*\*\*

galaxy-class drums

now and then the stars align, and my drumming life crosses paths with my passion for the night sky. saber's beads was particularly apt, as the tips of drumsticks are also called beads. another epiphany led me to start adapting cymbal stands as additional binocular mounts when needed. and recently i stumbled upon a variety of kick drum heads featuring galaxies, planets, nebulae, et al. check out [visionarydrum.com](http://visionarydrum.com) for my latest kit accoutrements.

\* \* \* \* \*

caldwells 109- haters 0

it's gotta be tough being an anti-u.k., anti-nasa caldwell hater these days. for the catalogues 25th anniversary, nasa and hubble not only did a major photoshoot of sir patrick's 109 deepsky gems, but have also endorsed the caldwell numbers as their primary ids. would this finally silence the few remaining never-moore-ers and their sad hubris of the defeated?

i sure hope not. the controversy and free publicity has been so instrumental in the catalogue's success that there's no telling how popular it can still become...

the seenines

*(in the not too distant future...)*

hyperlight communication has given us contact with the people from an exo-planet near c9, the cave nebula. turns out they'd been evesdropping on us and become so enamored with the controversy and that sir patrick had picked their hometown out of billions that the species unanimously voted to rename themselves the 'seenines'.

upon further contact, interstellar war was narrowly averted when a small generationally indoctrinated cult of caldwell deniers- refusing to acknowledge the seenines identity- were instead captured and sentenced to dress as monks and alternate chanting c-numbers with smacking stone tablets against their foreheads.

(yes, the seenines also became big monty python fans.)

\*\*\*\*\*

ever play guess the radec?

with 2 midsized airports to my north and south, and o'hare a couple hours west, it's rare to see a sky without a contrail. multiple crossing contrails involuntarily remind me of the radec grid, and i'm compelled to start assigning their estimated hours and declinations.

please tell me i'm not the only one.

\*\*\*\*\*

earth/space porn on chromecast

the beautiful, updating astro-backdrop/slideshow is another nice benefit to blowing-up your mobile's display onto a big screen. (firestick, too.) highly recommended.

\*\*\*\*\*

waning interest: hunting the oldest crescent moon

if you're into chasing thin crescents and not taking advantage of the waning slivers, you're missing half of the challenge and rewards. dawn crescents don't get nearly the attention of their dusk counterparts. there is no cultural significance and most of the world is still asleep. this is unfortunate as oldest crescents usually enjoy cleaner, steadier air, and observers already have a jump on dark adaptation. catching the thin horn of luna's limb emerging from the horizon can also be an addictive twist to the dusk event. the still of the night also lends itself to creating a more peaceful and contemplative experience.

double your pleasure, practice, and conquests- support your oldest crescents.

\*\*\*\*\*

"what does it take to see saturn's rings? i've got 4k to spend."

4k will certainly buy some jaw-dropping views of the rings. fortunately, run-of-the-mill amazing rings are available for alot less. near opposition, even a 25x binocular will show a tiny but crisp disc/ring system. it takes about 30x when saturn's out roving around the quadratures. there are even very sporadic reports of naked eye detections of the disc 'bulges'. as for myself, there were several nights surrounding the last ring plane crossing that i was able to detect the ring orientation unaided, as the rings appeared more like hands of a clock than just big ears. but if i had that much to spend on a scope right now i'd get a 9.25hd edge and load it for bear. by the way, it also does a wonderful job on thousands of other night sky treasures. (but mostly on saturn's rings.)

\*\*\*\*\*

those 5th galilean moons

jupiter occasionally tolerates a paparazzi fieldstar posing as a galilean to snap some pics (after all, many have light that has traveled hundreds of years for the encounter). but mars is welcomed as family, with ganymede even timing a special shadow transit for the red planet's visit: [https://youtu.be/jDL\\_B5MPQ2I](https://youtu.be/jDL_B5MPQ2I)

or, those 5th galilean moons

many are ecliptic gladiators, chomping at the bit to challenge the jovian gauntlet of head bouncers in an attempt to cross the system unscathed. 5.5 mag sigma aries pulled it off in august 2023. others are not so lucky: <https://flic.kr/p/2oZhB8u>

\*\*\*\*\*

beyond starhopping: sharpshooting

our scopes are shaped like grenade launchers and cannons. finders give us crosshairs and bull's-eyes.

those of us who still enjoy the theme and thrill of the hunt take pride in possessing a quick and accurate target acquisition. so i view starhopping as an initial reconnoiter, not a continuous requirement.

sharpshooters practice what has also been referred to as 'spatial acuity'. basically, this is memorizing simple asterisms formed by nearby visible stars and a finder's red dot (or other) reticle pattern.

many of us reflexively form invisible asterisms on a regular basis. in light-polluted skies we fill in the dimmer stars of the little dipper or corona borealis. sharpshooting is the dso equivalent. an excellent exercise is to see the red dot as the target itself. after completing an observation take another look thru the finder with both eyes open and imagine the red dot completing a simple local star pattern (a triangle, an 'L', etc.). return the scope or binoculars to a neutral start position and aim again to recenter the target solely as the completion of a stellar pattern. using ones lowest power/widest field ep is recommended, as this allows a larger margin for error.

it won't happen overnight, and some are tougher than others, but with repetition this logistic reinforcement will allow the observer to eventually memorize hundreds of otherwise invisible dso positions and skip the celestial pinball routine altogether.

building this personal go-to database of 'lock and load' targets is both a goal and reward of proficient starhopping.

the 110 messier objects are popular sharpshooting targets. becoming intimate with their positions is also essential for those wishing to test their prowess while running the m-cubed (messier marathon from memory).

\*\*\*\*\*

saturn's teasing tilt

it's a pleasant fiction to imagine saturn's beautiful rings coyly and seductively tilting toward and away from us, slightly by the month and dramatically over a decade. but earth is actually doing the unsung grunt work, carefully pacing itself to fall slightly farther behind saturn in its orbit over the course of each revolution. this allows us the amazing perspective of cycling ring aspects. sorry to dampen anyones fantasy. just something to contemplate at the eyepiece, and while watching the linked vidclip below.

in motion: saturn's northern ring crossing (jan 2009-sep 2010) at

<http://www.saberscorp.x.vidmeup.com>

\*\*\*\*\*

#### stoking the embers

outer atmospheres of suns containing a majority of carbon rather than oxygen only allow the red spectrum of their light to reach our eyes.  
the beauty of these aptly colored carbon stars has also stopped most of us in our tracks while panning thru the eyepiece.  
specifically hunting and comparing these scattered blood diamonds is one of the more forgiving amateur pursuits, as less-than-perfect seeing and altitude often only accentuate their fiery presence.  
the astronomical league offers a great program for those ready to start chasing these stellar gems. check it out at <https://www.astroleague.org/content/carbon-star-observing-program>  
happy hunting!

\*\*\*\*\*

#### outreach: think accessibility

i'm not a recruiter. just offering to share the view.  
unless they want to be recruited. then i feel like a drug dealer, as there's possible addiction and withdrawal involved.  
in any case, the easier we make it look, the more people feel they can try it themselves.  
i try to speak in layman's terms as much as possible, as if there's no new 'language' to learn.  
not all at once, anyway.  
relate that any cloud-free sky will do, and that a modest scope, or even those binoculars in the closet are all they need. i have a couple of 8x40s that i pass around to supervised groups while they wait in line.  
i usually do public outreach under some waxing moon phase and stick with whatever other naked-eye showpieces are available (except by request).  
quality/wow factor over quantity. three or four bright targets per group or person is all you really need (i.e., always leave the crowd wanting more).  
also, everyone is welcome, whether they want to become an astronomer or astrologer or join the x-files. (those who pathologically correct visitors on every scientific nuance cross the line into 'outreach', and become the stereotype droll know-it-alls.) i'm not there to criticize how anyone enjoys the stars. in fact, i'm intrigued by the different attractions and curiosities the night sky evokes. the cream will rise to the top without any bias from the host.  
beyond that, it's just about making the experience more interesting than academic and enjoying the reactions when that tiny spot of light hits their pupil.  
i offer cellphone snaps at the ep for souvenirs, and of course have plenty of old astromags/catalogs, dark sky brochures, and local club info available.  
most importantly- and this cannot be overstated- use a 5mw laser pointer to point stuff out. people (kids especially) are entranced by it. many would stay for the light show alone.  
it is, however, at your discretion whether or not to make the light saber sound while using it.

\*\*\*\*\*

#### butch and sundance

i remember only two of us from the club showing up to handle 250 scouts on a sugar-high stampeding in the dark  
toward the observing field at once. the ground and scopes were shaking.  
quite a daunting experience until the dust settled and the panting troop leaders caught up to them.

\*\*\*\*\*

#### caldwell 76: under-appreciated?

At -42° dec, C76 (I call it the 'less-southern jewel box') is just being shy.  
If the beautiful bright cluster was circumpolar it would probably die of embarrassment from all the attention.

\*\*\*\*\*

#### 30x80 barska x-trail revisited

i watched mare crisium spit out aldeberan after an occultation a few nights ago using the barska 30s. very enjoyable. amazing lunar terminator detail, as always.  
everything about it from my initial review years ago still holds true. still aligned, still mechanically sound, eye relief still useable but wanting.

what i did want to ammend is that the fully-coated barska's color correction may not necessarily be better than that of the fmc 30x orion megaview- but perhaps the brighter



image/decreased contrast may simply render it less noticeable. this also implies that, in some cases, vivid CA may be a result of better AR coatings- and that those highly offended by false color might be better appeased by fully-coated or multi-coated models.

just an intuitive thought, but i'll let you be the judge.

the 30s were not my first experience with vivid vs 'bleached' CA. while comparing four 8x40s, the fully-coated model also outperformed the other 3 fmc noks on (noticeable) CA.

i also still employ and recommend my hi-mag training routine for steadier handheld views thru lower-power binos, whether it's a 30x warm-up before dropping to 15x, or 15x prior to 8-10x sessions.

anyway, the barska 30x is still providing bang long after the buck. versus my 25x100, the barska not only has the adler index (and easily observed) edge in power, but often gets more use due to its smaller grab-n-go size and light weight.

and the 30x stereo views of saturn and luna alone will always be worth the bargain price.

peace, stephen.

saber does the stars at:

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)

\*\*\*\*\*

forced statutory outreach:

the night i crashed the science fair

my brother's kid had brought home a flyer from school announcing an upcoming science fair and the evening's program; simple demonstrations of basic physics, geology, chemistry, etc. but conspicuous by its absence was any mention of space, astronomy, or even a lousy solar system diorama.

the final rub was that this was taking place at, not just any grade school, but my own hometown childhood almatater- so now it was personal.

politely, but thru gritted teeth, i called the school ready to verbally pound some sense into this blasphemous principal's head...

okay, that's enough dramatics.

just wanted to convey my initial reaction. i was even suprised at how betrayed i felt.

anyway, a semblance of sanity prevailed allowing me to see this as a sad but excellent outreach opportunity.

sure it was december and cold for public outdoor observing, but not even an indoor table display or a few hubble pics?

in the end they were thrilled to have me bring a scope, some noks, and a variety of outreach material.

my 18" round laminated moon pic was hung at the far end of the gym above the bleachers for observing practice.

but my glp easily stole the show, giving me a big audience of parents and children on which to also impress the dangers and legal ramifications of improper laser use.

it was a fun evening and i was invited back in the spring for a full-blown outdoor event.

being back at my old grade school was an experience in itself. in 6th grade our class held the annual folk festival in the same gym. my group's exhibit- brazil- had also been the most popular, especially with the adults.

ours was the only country serving coffee.

peace, stephen

p.s., speaking of glps, it's extremely difficult to preach responsible laser use when you have the overpowering urge to make the light saber sound while demonstrating them.

\*\*\*\*\*

do u observe alone at remote locations?

from a preference standpoint: sure. whenever i'm not sharing views with the public and have time for the drive.

alone with the stars it's a much more intense bonding experience. like it's all on display just for me.

from a danger/life-threatening standpoint: doesn't bother me a bit. there are worse ways to go than with saturn or a favorite dso in the eyepiece.

in fact, it would be my third preferred 'found dead while' scenario. the second would be while behind the drums.

\*\*\*\*\*

**i was a teenage exit pupil abuser**

9x63, 10x70, 11x80. there was a time i couldn't get enough wasted light. spraying it like a firehose from the eyepieces of my binoculars during nights on end of gluttony and laughter. after all, i had convinced myself, there was a free and neverending supply. i crashed numerous star parties- aiming the back of my noks at nearby dso observers, and giggling as they flinched from my venomous stray light intruding on their precious night vision. i scoffed criticisms from my elders that there were children starving for light in cloud-covered cambodia. cursing disapproval, several others would often swarm behind me to catch and splash the spewing overflow of photons in their eyes that would otherwise bounce without purpose off the grass and onlooking sheep behind me.

but exit pupil laws were becoming increasingly strict, and my freewheeling cowboy lifestyle finally caught up with me. at one event i was hauled off the field by the national ExP guard and brought before a judge. sentenced to 5 years of hard labor, poor transparency, and a harshly restricted 30x50, i spent many tearful nights repenting the tomfoolery of my youth.

[epilogue: bino exit pupil is often overrated. like aperture, more is always preferable to not having enough. eye placement is less critical with large ExPs as well. iow, don't let an oversized ExP override your enjoyment of the night sky.]

\*\*\*\*\*

**zerbatory blues**

after making the 45 minute drive to our blue zone observatory, confining myself to its rectangular slit of heaven would be torture. i spend a good deal of time set up in the surrounding field and rolling around in the grass like a kid in a candy store, too.

\*\*\*\*\*

**Not Another Moon Illusion**

Depending on your level of intimacy, most people have experienced up to 3 moon illusions; the size illusion (moon appears larger near the horizon), the depth illusion (moon craters appear as domes aka the 'convex/concave con'), and the terminator illusion (illuminated portion of moon appears offset to direct sun rays).

Another that's followed me thru the years of lunar observing is not so much an illusion as a temporal inconvenience.

The 1.3 seconds it takes for the moon's reflected light to reach us translates to a time-delayed terminator. Whether by inches or yards (cms or meters), the terminator has always advanced farther than what we're seeing from earth. So, while we're slightly ripped-off when the moon is waxing, the waning phases constantly allow us to see features that are actually already in darkness.

Ashen light (earthshine) takes an additional bounce to reach us, so we're actually seeing that area as it appeared 2.6 seconds ago.

The time machine increases dramatically when we view the more distant planets and stars. Saturn's illuminated image, for example, is always roughly 90 minutes old as viewed from earth.

Good stuff to consider next time you see our closest neighbors.

\*\*\*\*\*

**Best Stargazing Locations (U.S.)**

Many people are only a 15-20 minute drive away from the most stars they have ever seen. Center your location on the linked map. Green areas are very good.

Blue is even better. Gray/Black is as good as it gets.

Plan a short road trip to these areas on a clear, moonless night and soak in the stars.

[http://www.jshine.net/astromony/dark\\_sky/](http://www.jshine.net/astromony/dark_sky/)

\*\*\*\*\*

**Show Me My Star**

If you'd like a free photo of that honorary star named for a friend or loved one just follow these simple instructions.

<http://www.pictureofmystar.blogspot.com/>

**Best Colorful Double Stars**

<http://bestcolorfuldoublestars.blogspot.com/>

### Deep Sky Lists: Concorde Borealis

<http://concordiemborealis.blogspot.com/>

### New Moon: Extreme Crescent Visibility

<http://astro.ukho.gov.uk/moonwatch/nextnewmoon.html>

(great site. email them to include last crescents before new moon, too!)

### LROC Interactive Lunar Map

<http://target.lroc.asu.edu/q3/>

### Total Solar Eclipse Seen From The Moon

<https://youtu.be/-jxwxwAnyfQ>

### Herschel 400 by Declination

Mostly for kicks, but a good reference for target availability and prioritization.

<http://www.herschel400bydeclination.blogspot.com>

### NGC Asterisms/Going Deep For Doubles: The NGC 140

<http://www.ngcasterisms.blogspot.com/>

### Quick And Dirty Binocular Mag Comparisons

<http://binomagcomparisons.blogspot.com/>

### Saturn: The Motion Picture

[https://youtu.be/Sv\\_qsDYLH4Y](https://youtu.be/Sv_qsDYLH4Y)

\*\*\*\*\*

### Lightspeed Distance to the Planets (from Earth, closest approach):

Mercury 5m10s

Venus 2m15s

Mars 4m20s

Jupiter 35m

Saturn 1h10m

Uranus 2h30m

Neptune 4h10m

(The current distance to Pluto is 4h39m)

\*\*\*\*\*

### First Scope and Eyepieces

Buy the most aperture that is both affordable and portable. Portability should be easy enough that it never becomes an issue or reason not to setup or travel. Some don't think twice about regularly moving 100 lbs of equipment around while some think anything over 25 lbs is a chore. Vehicle accomodation is a consideration if one plans to travel. Which type of scope is more intuitive to use? Some people naturally take to the operation of a Dob over a Cat and vice-versa. The remaining design pros and cons tend to cancel each other out, and are usually not of crucial importance as both provide amazing views. Goto scopes also provide fine images, but a solid familiarity with the brightest stars and constellations is required to avoid alot of operational frustration.

For eyepiece needs, a 32mm Plossl, 24-8mm premium zoom, and shorty barlow will be more than enough to cover most useable powers in most scopes. At the same time I recommend collecting and enjoying as many Naglers as possible.

\*\*\*\*\*

### A Mount By Any Other Name

For not being a binocular tripod fan, I sure have enough of them.

When I'm not beating on my drumkit the cymbal stands are all available for duty as sturdy

mounts for my noks. They've occasionally been used at outreach events for multiple viewers as well.

With the cymbal stand boom arms adjusted to the vertical many can extend up to 84". Most are compatible with bino adapters, and the more robust models can easily handle my 100mm guns.

An alternate mounting choice that often gets overlooked, some music stores carry used boom stands for less than \$50.

\*\*\*\*\*

### In Praise Of Shallow Ecliptics

Flat ecliptics are no fun for planet viewing or young crescent moon sightings, and often means it's pretty cold outside. But it does give me a better sense of orientation with the Solar system.

In a world where 'north' is usually associated with 'up', it just feels more natural to be looking directly across the planets' orbits with my head and feet more aligned to Sol's north and south poles.

Near the other extreme, viewing a perpendicular ecliptic means I'm standing on the Earth's side and should be falling off the limb and into space.

It's a very Earth-centric bias and one I've been reluctant to share out of shame.

For those who have not experienced this I should have warned you ahead of time not to read this as it may trigger unwarranted vertigo and uneasiness during future obs sessions. My bad.

\*\*\*\*\*

### Caldwell Fever

*Stephen Saber*



C76 (ngc6231) in Scorpius  
courtesy of SDSS

I bagged the Caldwells as an elective project en route to the A.L. Master Observer's award and found them to be a worthy and, in a few cases, challenging DSO refresher course. By request, the following is a jump-start for those in pursuit of Sir Patrick's favorite 109 non-Messier treasures. His concept was a forefather of modern post-Messier collections which has also inspired, often by its notoriety, a slew of the individual lists we see today. For the intermediate observer, this is a very nice warm-up for the Herschel 400 as most of the northern Caldwells also appear in that list. Only 70 targets are required to receive this award, making the program available to observers in either hemisphere (but don't let that stop you from traveling to enjoy the rest). The targets being numbered by declination also gives a much more intuitive idea as to their local altitude and availability. Prefacing the Caldwell catalogue

designations below are the host constellation, its mid-point midnight culmination date, and respective Pocket Sky Atlas chart(s). Multiple targets within a constellation are ordered in suggested search sequences. Along with the object type, magnitude, and radec, an additional identifier is included for those using maps not updated with this iconic deepsky database's id.

cma / jan02 / psa27

C64 oc 4.1 0719-2457 (ngc2362)

C58 oc 7.2 0718-1537 (ngc2360)

gem / jan05 / psa25

C39 pn 9.9 0729+2055 (ngc2392)

mon / jan05 / psa25, 26

C50 oc 4.8 0632+0452 (ngc2244)

C49 bn -- 0632+0503 (ngc2237-9)

C46 bn 10.0 0639+0844 (ngc2261)

C54 oc 7.6 0800-1047 (ngc2506)

pup / jan08 / psa28

C71 oc 5.8 0752-3833 (ngc2477)

lyn / jan19 / psa23

C25 gc 10.4 0738+3853 (ngc2419)

cnc / jan30 / psa24

C48 gx 10.3 0910+0702 (ngc2775)

car / jan31 / psa39, 38

C96 oc 3.8 0758-6052 (ngc2516)

C90 pn 9.7 0921-5819 (ngc2867)  
C92 bn 6.2 1044-5952 (ngc3372)  
C102 oc 1.9 1043-6424 (ic2602)  
C91 oc 3.0 1106-5840 (ngc3532)

vel / feb13 / psa39

C85 oc 2.5 0840-5304 (ic2391)  
C79 gc 6.7 1018-4625 (ngc3201)  
C74 pn 8.2 1008-4026 (ngc3132)

sex / feb22 / psa37

C53 gx 9.1 1005-0743 (ngc3115)

cha / mar01 / psa30

C109 pn -- 1010-8052 (ngc3195)

leo / mar01 / psa34

C40 gx 10.9 1120+1821 (ngc3626)

hya / mar15 / psa36, 46

C59 pn 8.6 1025-1838 (ngc3242)  
C66 gc 10.2 1440-2632 (ngc5694)

cru / mar28 / psa49

C99 dn -- 1253-6300 (coalsack)  
C98 oc 6.9 1242-6258 (ngc4609)  
C94 oc 4.2 1254-6020 (ngc4755)

cen / mar30 / psa49, 48

C100 oc 4.5 1137-6302 (ic2944)  
C97 oc 5.3 1136-6137 (ngc3766)  
C80 gc 3.6 1327-4729 (ngc5139)  
C83 gx 9.5 1306-4928 (ngc4945)  
C77 gx 7.0 1326-4301 (ngc5128)  
C84 gc 7.6 1346-5122 (ngc5286)

mus / mar30 / psa50

C108 gc 7.8 1226-7240 (ngc4372)  
C105 gc 7.3 1300-7053 (ngc4833)

com / apr02 / psa45

C36 gx 9.8 1236+2758 (ngc4559)  
C38 gx 9.6 1236+2559 (ngc4565)  
C35 gx 11.4 1300+2759 (ngc4889)

cvn / apr07 / psa43

C26 gx 10.6 1218+3749 (ngc4244)  
C32 gx 9.3 1242+3232 (ngc4631)  
C29 gx 9.8 1311+3703 (ngc5005)  
C21 gx 9.4 1228+4406 (ngc4449)

vir / apr11 / psa45

C52 gx 9.3 1249-0548 (ngc4697)

cir / apr30 / psa48

C88 oc 7.9 1506-5536 (ngc5823)

boo / may02 / psa44

C45 gx 10.2 1338+0853 (ngc5248)

nor / may19 / psa58

C89 oc 5.4 1619-5754 (ngc6087)

aps / may21 / psa60

C107 gc 9.3 1626-7212 (ngc6101)

tra / may23 / psa60

C95 oc 5.1 1604-6030 (ngc6025)

dra / may24 / psa31, 51

C3 gx 9.7 1217+6928 (ngc4236)  
C6 pn 8.8 1759+6638 (ngc6543)

crv / may28 / psa36

C60 gx 11.3 1202-1852 (ngc4038)

C61 gx 13.0 1202-1853 (ngc4039)

sco / jun03 / psa58

C76 oc 2.6 1654-4148 (ngc6231)

C75 oc 5.8 1626-4040 (ngc6124)

C69 pn 12.8 1714-3706 (ngc6302)

ara / jun10 / psa58

C82 oc 5.2 1641-4846 (ngc6193)

C86 gc 5.6 1741-5340 (ngc6397)

C81 gc 8.1 1726-4825 (ngc6352)

cra / jun30 / psa69

C78 gc 6.6 1808-4342 (ngc6541)

C68 bn 9.7 1902-3657 (ngc6729)

sgr / jul07 / psa66

C57 gx 9.3 1945-1448 (ngc6822)

pav / jul15 / psa70

C93 gc 5.4 1911-5959 (ngc6752)

C101 gx 9.0 1910-6351 (ngc6744)

vul / jul25 / psa62

C37 oc 5.7 2012+2629 (ngc6885)

cyg / jul30 / psa62

C15 pn 9.8 1945+5031 (ngc6826)

C27 bn 7.5 2012+3821 (ngc6888)

C20 bn 6.0 2059+4420 (ngc7000)

C33 sn -- 2056+3143 (ngc6992/5)

C34 sn -- 2046+3043 (ngc6960)

C19 bn 10.0 2154+4716 (ic5146)

del / jul31 / psa64

C47 gc 8.9 2034+0724 (ngc6934)

C42 gc 10.6 2102+1611 (ngc7006)

aqr / aug25 / psa77, 76

C55 pn 8.3 2104-1122 (ngc7009)

C63 pn 6.5 2230-2048 (ngc7293)

lac / aug28 / psa73

C16 oc 6.4 2215+4953 (ngc7243)

peg / sep01 / psa74

C30 gx 9.5 2237+3425 (ngc7331)

C44 gx 11.0 2305+1219 (ngc7479)

C43 gx 10.5 0003+1609 (ngc7814)

tuc / sep17 / psa80

C106 gc 4.0 0024-7205 (ngc104)

C104 gc 6.6 0103-7051 (ngc362)

scl / sep26 / psa09

C72 gx 8.2 0015-3911 (ngc55)

C70 gx 8.1 0055-3741 (ngc300)

C65 gx 7.1 0048-2517 (ngc253)

cep / sep29 / psa73, 71

C12 gx 9.7 2035+6009 (ngc6946)

C4 bn 6.8 2102+6812 (ngc7023)

C9 bn 7.7 2259+6237 (sh2-155)

C2 pn 11.6 0013+7232 (ngc40)

C1 oc 8.1 0044+8520 (ngc188)

cas / oct09 / psa03, 01

C11 bn 7.0 2321+6112 (ngc7635)

C18 gx 9.2 0039+4820 (ngc185)

C17 gx 9.3 0033+4830 (ngc147)

C13 oc 6.4 0119+5820 (ngc457)

C10 oc 7.1 0146+6115 (ngc663)

C8 oc 9.5 0130+6318 (ngc559)

and / oct09 / psa03, 02

C22 pn 9.2 2326+4233 (ngc7662)  
C28 oc 5.7 0158+3741 (ngc752)  
C23 gx 9.9 0223+4221 (ngc891)

cet / oct15 / psa07  
C62 gx 8.9 0047-2046 (ngc247)  
C56 pn 8.0 0047-1153 (ngc246)  
C51 gx 9.0 0105+0207 (ic1613)

for / nov02 / psa06  
C67 gx 9.2 0246-3017 (ngc1097)

per / nov07 / psa02  
C14 doc 4.3 0220+5708 (ngc869/884)  
C24 gx 11.6 0320+4131 (ngc1275)

hor / nov10 / psa08  
C87 gc 8.4 0312-5513 (ngc1261)

tau / nov30 / psa15  
C41 oc 1.0 0427+1600 (mel25)

dor / dec17 / psa20, D  
C103 bn 1.0 0539-6906 (ngc2070)

col / dec18 / psa18  
C73 gc 7.3 0514-4003 (ngc1851)

aur / dec21 / psa12  
C31 bn 6.0 0516+3416 (ic405)

cam / dec23 / psa11, 21  
C5 gx 9.2 0347+6806 (ic342)  
C7 gx 8.9 0737+6536 (ngc2403)

[A.L. Caldwell Program Homepage](#)  
[Caldwell Telrad Finder Charts](#)

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*\*blog under construction\**  
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#### COMING SOON:

[Glass At A Glance: Orion 25x100 GiantView Binocular](#)  
[The Mess-Cal Marathon](#)  
[The Last GoTo Convert](#)  
[Lucky Ned Pepper \(And The Steadiest Hands In The West\)](#)

#### Also see:

[Saber Does The Stars](#)  
[pdf \(unformatted\)](#)

#### Recommended Astro Links:

<http://www.astroleague.org/>  
<http://www.darksky.org/>  
<http://www.astronomy.com/>  
<http://www.skyandtelescope.com/>  
<http://astronomy.fm/>  
<http://eyesonthesky.com/Home.aspx>  
<http://www.astromax.org/>  
<http://www.ngcicproject.org/>  
<http://www.messier45.com/>  
<http://www.astronomertalk.com/index.php>  
<http://www.iceinspace.com.au/index>  
<http://stargazerslounge.com/>  
<http://www.galaxyzoo.org>  
<http://www.astronomerswithoutborders.org/>  
<http://www.cloudynights.com/>  
<http://www.spaceweather.com/>  
<http://messier.seds.org/xtra/marathon/>  
<http://pacastronomy.50megs.com/>  
<http://www.saguaroastro.org/>  
<http://10minuteastronomy.wordpress.com/>  
<http://tinyurl.com/sittinginplato1>

\*\*\*\*\*

No comments:



saber, stargazing, caldwell asterisms, astronomy, caldwell catalogue, deepsky, double stars, music, name a star, night sky, outreach, saber's beads, stargazing, stephen saber, you tube

## Messier-Caldwell (MesCal) Marathon



by stephen saber

adding the available caldwell showpieces- many within a stone's throw of the messiers- is a rewarding way to keep the marathon dso hunt momentum going while waiting for the sky to turn.

here's a template for 40deg N, but can easily vary as to when one wishes to jump on and off the messier track, and for latitude dependent target additions/omissions. this route adds 62 caldwells to the 110 messiers. some march caldwells not reaching at least 10deg altitude are not included.

M74, M77, M33, C28, C23  
M31, M32, M110, C18, C17  
M52, C11, C13  
M103, C8, C10, C5, C14  
M76, M34, C24, M45

M79, M42, M43, M78, M50, M41  
C64, M93, C58, M46, M47, C54  
M48, C50, C49, C46

C41, C39, M35, M1, M37, M36, M38  
C31, C25, M44, M67, C48  
M95, M96, M105, M65, M66  
C40, C53, C59

M81, M82, C7, C3  
M97, M108, M109, M40, M106  
C21, C26, C32, C29  
M94, M63, M51, M101, M102

M98, M99, M100, M85, M84, M86  
M87, M88, M91, M90, M89  
M58, M59, M60, M49, M61

C38, C36, C35, M64, M53, M3



C45, C52, M104, C60, C61  
M68, M83, C66

M5, M13, M92, C6, C1  
M57, M56, C15, M39, C20, M29  
C27, C33, C34, C37, M27, M71

M12, M10, M14, M107, M9, M4  
M80, M62, M19

M11, M26, M16, M17, M18, M24  
M25, M23, M21, M20, M8, M28  
M22

C75, C76, C69, M6, M7  
M69, M70, M54, M55, M75  
C57, C47, C42, M15, M2  
M72, M73, C55

\*C30, C19, C16, C22  
C12, C4, C9, C2, M30

\*this pre-m30 target sequence is ordered to allow cepheus maximum altitude while moving away from the approaching morning twilight dome.

as with the m-cubed, hardcore mesal marathon hunters wanting to preserve maximum nightvision and spend more time observing should practice memorizing and sharpshooting this list in smaller groups throughout the year.

Matt Wedel's appreciated follow-up: *Concordiem Australis*

\*\*\*\*\*

[c38/the needle galaxy courtesy of sdss]

No comments:



saber, stargazing, caldwell astronomy, binoculars, caldwell catalogue, clusters, dso, galaxy, nebula, observing lists, stargazing, telescope

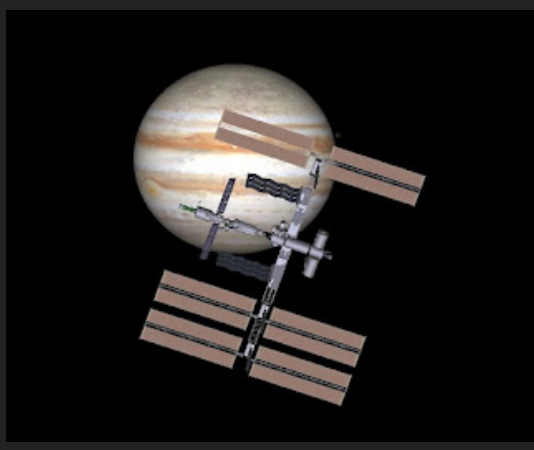
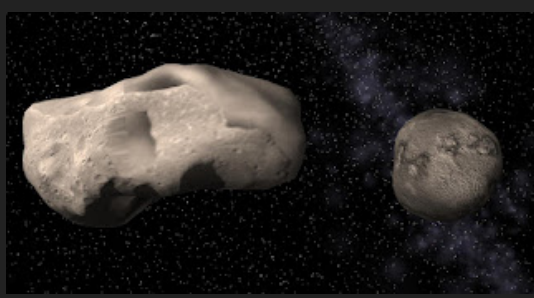
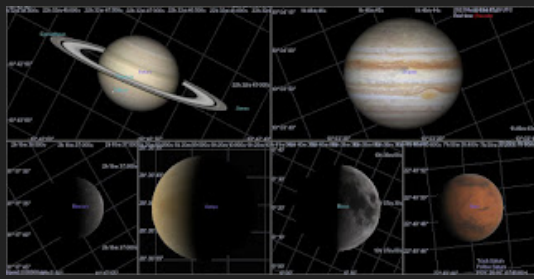
## Saber Does The Stars: Astro Sims Gallery

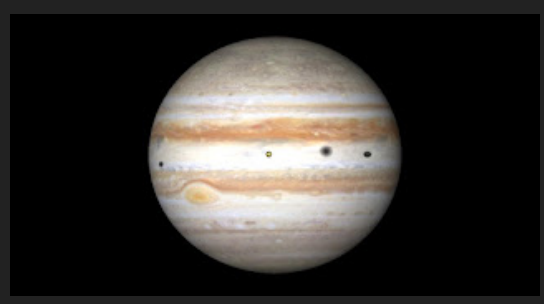
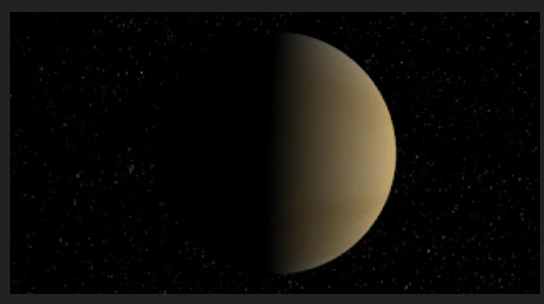
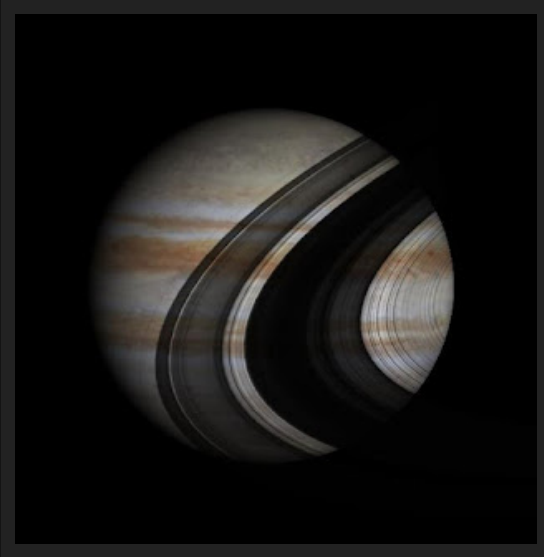


saturn transits the sun (viewed from neptune)  
\*created with celestia\*

***Celestia*** planetarium software has saved my sanity on countless cloudy nights for both its accurate real-time sky display, and as a creative outlet to observe rare and/or currently spaceflight-limited events by virtually traveling across time and space. The vids and clips to this gallery and more can be found at <http://www.youtube.com/@saberzastrovidz> . Enjoy!

[all images are free use with author/website acknowledgement]





<http://www.youtube.com/@saberzastrovidz> <http://www.tinyurl.com/c14isawesome>  
<http://www.tinyurl.com/saberdoesthestarz> related searches: astronomical league,  
hubble's caldwell catalogue, messier-caldwell marathon, m-cubed, messier marathon  
from memory, deepsky lists/concordiem borealis, c14 is awesome, saber's beads,  
stephen saber, saberscorp, saber does the stars

\*\*\*\*\*

No comments:



saber, stargazing, caldwell ally's braid, astronomical league, astronomy, caldwell catalog, concordiem borealis, deepsky, drummers, eclipse, messier marathon, messier marathon from memory, messier-caldwell marathon, moon, musicians, outreach

## 2023-2024 Lunar X Timings



2023 Jan 29 0056 UT  
Feb 27 1521 UT  
Mar 29 0518 UT  
Apr 27 1827 UT  
May 27 0644 UT  
Jun 25 1816 UT  
Jul 25 0520 UT  
Aug 23 1619 UT  
Sep 22 0338 UT  
Oct 21 1540 UT  
Nov 20 0437 UT  
Dec 19 1831 UT

2024 Jan 18 0905 UT  
Feb 16 2349 UT  
Mar 17 1410 UT  
Apr 16 0341 UT  
May 15 1613 UT  
Jun 14 0349 UT  
Jul 13 1448 UT  
Aug 12 0131 UT  
Sep 10 1229 UT  
Oct 10 0009 UT  
Nov 08 1249 UT  
Dec 08 0236 UT

\*timings courtesy of Dana Thompson\*  
\*photo credit: frostydew.org\*

UT to local time conversion:  
[www.timebie.com/timelocal/universal.php](http://www.timebie.com/timelocal/universal.php)

saber does the stars at:  
<http://saberdoesthestars.wordpress.com>  
<http://c14isawesome.blogspot.com>  
<http://www.youtube.com/saberzastrovidz>

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No comments:



saber, stargazing, caldwell astrology, astronomy, binoculars, clinton, lunar x, moon, obama, saber's beads, stargazing, stephen saber, telescopes, trump

## Concordiem Borealis



by Stephen Saber

This collection of DSOs and doublestars unifies the Astronomical League's Messier, Bino Deepsky, Caldwell (the 76 most northern), and Double Star targets as well as the RASC's 110 Finest NGC Objects (90 of which are Herschel 400s). Three doubles I couldn't live without are also included. Designed with those tackling the Observe Programs in mind, the overlapping entries have been omitted- leaving a treasure chest of 400+ gems for northern observers. Grouped by constellation, the basic data and corresponding Pocket Sky Atlas chart follow each entry.

### ANDROMEDA

obj/type/mag/radec/psa

M31 GX 3.5 0043+4119 03

M32 GX 8.2 0043+4055 03

M110 GX 8.0 0041+4144 03

C28/NGC752 OC 5.7 0158+3743 02

C23/NGC891 GX 10.0 0223+4223 02

C22/NGC7662 PN 9.0 2326+4236 03

gammaAnd DS 2.3 0204+4222 02

### AQUARIUS

M2 GC 6.5 2134-0047 77

M72 GC 9.4 2054-1230 77

M73 AS 9.0 2059-1236 77

C55/NGC7009 PN 8.0 2105-1120 77

C63/NGC7293 PN 7.5 2230-2046 76

zetaAqr DS 4.3 2229-0001 77

94 Aqr DS 5.3 2319-1328 76

### AQUILA

NGC6709 OC 6.7 1852+1022 65

NGC6781 PN 12.0 1919+0634 65

57 Aql DS 5.8 1955-0814 66

### ARIES

NGC772 GX 10.3 0200+1903 04

gammaAri DS 4.8 0154+1918 04

lambdaAri DS 4.9 0158+2336 04

#### AURIGA

M36 OC 6.0 0537+3408 12  
M37 OC 5.6 0553+3233 12  
M38 OC 6.4 0529+3550 12  
NGC1893 OC 7.5 0523+3324 12  
NGC1907 OC 8.2 0529+3519 12  
NGC1931 CN 11.3 0532+3415 12  
NGC2281 OC 5.4 0650+4103 23  
C31/IC405 EN — 0517+3416 12  
thetaAur DS 2.7 0600+3713 12

#### BOOTES

C45/NGC5248 GX 10.2 1338+0851 44  
NGC5466 GC 9.1 1406+2830 44  
deltaBoo DS 3.5 1516+3319 42  
iotaBoo DS 4.9 1416+5122 42  
kappaBoo DS 4.6 1414+5147 42  
epsilonBoo DS 2.5 1445+2704 44  
muBoo DS 4.3 1525+3723 42  
piBoo DS 4.9 1441+1625 44  
xiBoo DS 4.7 1451+1906 44

#### CAMELOPARDALIS

NGC1501 PN 13.0 0408+6056 13  
C7/NGC2403 GX 8.4 0738+6535 21  
NGC2655 GX 10.1 0857+7811 21  
C5/IC342 GX 9.1 0348+6807 11  
Stock23 OC 6.5 0316+6002 11  
Kemble1 OC 4.0 0358+6306 11  
1 Cam DS 5.7 0432+5355 12  
32 Cam DS 5.3 1249+8325 21

#### CANCER

M44 OC 3.1 0841+1957 24  
M67 OC 6.9 0851+1147 24  
C48/NGC2775 GX 10.3 0911+0700 24  
iotaCnc DS 4.2 0847+2846 24  
zetaCnc DS 5.5 0812+1739 24

#### CANES VENATICI

M3 GC 6.3 1343+2821 44  
M51 GX 8.4 1330+4710 43  
M63 GX 8.6 1316+4159 43  
M94 GX 8.2 1251+4104 43  
M106 GX 8.3 1219+4715 43  
NGC4111 GX 10.8 1208+4301 43  
NGC4214 GX 9.7 1216+3617 43  
C26/NGC4244 GX 10.2 1218+3746 43  
C21/NGC4449 GX 9.4 1229+4403 43  
NGC4490 GX 9.8 1231+4135 43  
C32/NGC4631 GX 9.3 1242+3229 43  
NGC4656/7 GX 10.4 1244+3207 43  
C29/NGC5005 GX 9.8 1311+3700 43  
NGC5033 GX 10.1 1314+3633 43  
alphaCVn DS 2.9 1256+3819 43

#### CANIS MAJOR

M41 OC 4.5 0646-2045 27  
NGC2359 EN 11.0 0719-1313 27  
C58/NGC2360 OC 7.2 0718-1538 27  
C64/NGC2362 OC 4.1 0719-2457 27  
epsilonCMa DS 1.5 0659-2858 27  
h3945 DS 5.0 0717-2318 27

#### CAPRICORNUS

M30 GC 7.5 2141-2309 77  
alphaCap DS 3.6 2018-1233 66  
betaCap DS 3.4 2021-1447 66

#### CASSIOPEIA

M52 OC 6.9 2325+6138 03  
M103 OC 7.4 0134+6044 03  
NGC129 OC 6.5 0030+6017 03  
C17/NGC147 GX 9.3 0034+4833 03  
C18/NGC185 GX 9.2 0039+4823 03  
NGC281 EN 7.0 0053+5640 03  
C13/NGC457 OC 6.4 0120+5823 03

C8/NGC559 OC 9.5 0130+6320 01  
C10/NGC663 OC 7.1 0147+6117 01  
C11/NGC7635 EN — 2321+6115 71  
NGC7789 OC 6.7 2357+5647 03  
IC289 PN 13.1 0311+6121 02  
Cr463 OC 5.7 0148+7157 01  
Stock2 OC 4.4 0215+5916 01  
Mark6 OC 7.1 0230+6039 01  
Mel15 OC 6.5 0233+6127 01  
Tr3 OC 7.0 0312+6315 01  
etaCas DS 3.4 0049+5749 03  
iotaCas DS 4.0 0229+6724 01  
sigmaCas DS 5.0 2359+5545 03

#### CEPHEUS

C2/NGC40 PN 11.0 0013+7235 71  
C1/NGC188 OC 8.1 0045+8523 71  
NGC6939 OC 7.8 2032+6040 61  
C12/NGC6946 GX 8.9 2035+6011 61  
C4/NGC7023 CN 7.0 2101+6812 71  
NGC7129 RN 12.0 2141+6608 71  
NGC7160 OC 6.1 2154+6238 71  
NGC7235 OC 7.7 2213+5719 71  
C9/Sh2-155 DN — 2257+6237 71  
betaCep DS 3.2 2129+7034 71  
deltaCep DS 3.9 2229+5825 71  
xiCep DS 4.4 2204+6438 71  
Struve 2816 DS 5.6 2139+5729 73

#### CETUS

M77 GX 8.8 0243+0001 04  
C56/NGC246 PN 8.0 0047-1150 07  
C62/NGC247 GX 8.9 0047-2043 07  
NGC936 GX 10.1 0228-0107 04  
C51/IC1613 GX 9.3 0105+0207 05  
gammaCet DS 3.5 0243+0314 04

#### COLUMBA

C73/NGC1851 GC 7.3 0514-4003 18

#### COMA BERENICES

M53 GC 7.7 1313+1807 45  
M64 GX 8.5 1257+2138 45  
M85 GX 9.2 1226+1808 C  
M88 GX 9.5 1232+1422 C  
M91 GX 10.2 1236+1427 C  
M98 GX 10.1 1214+1451 C  
M99 GX 9.8 1219+1422 C  
M100 GX 9.4 1223+1546 C  
NGC4274 GX 10.4 1220+2934 45  
NGC4414 GX 10.3 1227+3110 45  
NGC4494 GX 9.9 1232+2544 45  
C36/NGC4559 GX 9.9 1236+2755 45  
C38/NGC4565 GX 9.6 1237+2556 45  
NGC4725 GX 9.2 1251+2527 45  
C35/NGC4889 GX 11.4 1300+2755 45  
Mel 111 OC 1.8 1225+2600 45  
24 Com DS 5.2 1235+1823 45

#### CORONA AUSTRALIS

C68/NGC6729 EN 9.7 1902-3657 69

#### CORONA BOREALIS

zetaCrB DS 5.1 1539+3638 53  
sigmaCrB DS 5.6 1615+3352 53

#### CORVUS

C60/NGC4038 GX 10.7 1202-1855 47  
C61/NGC4039 GX 13.0 1202-1856 47  
NGC4361 PN 10.0 1225-1851 47  
deltaCrv DS 3.0 1230-1631 47

#### CYGNUS

M29 OC 6.6 2024+3834 62  
M39 OC 4.6 2132+4828 62  
NGC6819 OC 7.3 1942+4012 62  
C15/NGC6826 PN 10.0 1945+5032 62

C27/NGC6888 EN 7.5 2012+3822 62  
NGC6910 OC 7.4 2023+4049 62  
C34/NGC6960 SN — 2046+3045 62  
C33/NGC6992-5 SN — 2057+3145 62  
C20/NGC7000 EN 6.0 2059+4422 62  
NGC7027 PN 10.0 2107+4216 62  
NGC7063 OC 7.0 2125+3632 62  
C19/IC5146 CN 10.0 2154+4718 73  
betaCyg DS 3.1 1931+2758 62  
31 Cyg DS 3.8 2014+4644 62  
61 Cyg DS 5.2 2107+3845 62

#### DELPHINUS

C47/NGC6934 GC 8.7 2034+0724 64  
C42/NGC7006 GC 10.6 2102+1611 64  
gammaDel DS 4.5 2047+1607 64

#### DRACO

M102 GX 10.0 1507+5544 42  
C3/NGC4236 GX 9.7 1217+6928 41  
NGC5907 GX 10.4 1516+5619 42  
NGC6503 GX 10.2 1749+7009 61  
C6/NGC6543 PN 8.8 1759+6638 51  
muDra DS 5.7 1705+5428 52  
nuDra DS 4.9 1732+5511 52  
psiDra DS 4.9 1742+7209 51  
16/17 Dra DS 5.4 1636+5255 52  
40/41 Dra DS 5.7 1800+8000 51

#### ERIDANIS

NGC1232 GX 9.9 0310-2035 17  
NGC1535 PN 10.4 0414-1244 17  
32 Eri DS 4.8 0354-0257 17  
55 Eri DS 6.7 0444-0848 16

#### FORNAX

C67/NGC1097 GX 9.2 0246-3017 06

#### GEMINI

M35 OC 5.1 0609+2420 25  
NGC2158 OC 8.6 0608+2406 25  
NGC2371/2 PN 11.0 0726+2929 25  
C39/NGC2392 PN 9.9 0729+2055 25  
alphaGem DS 1.9 0735+3153 25  
deltaGem DS 3.5 0720+2159 25

#### HERCULES

M13 GC 5.9 1642+3627 52  
M92 GC 6.5 1717+4307 52  
NGC6210 PN 9.0 1645+2348 54  
alphaHer DS 3.5 1715+1423 52  
deltaHer DS 3.1 1715+2450 54  
kappaHer DS 5.3 1608+1703 55  
rhoHer DS 4.6 1724+3709 52  
95 Her DS 5.0 1802+2136 54

#### HYDRA

M48 OC 5.8 0814-0549 26  
M68 GC 8.2 1240-2648 47  
M83 GX 7.6 1337-2954 47  
C59/NGC3242 PN 8.6 1025-1838 37  
C66/NGC5694 GC 10.2 1440-2632 46  
N Hya DS 5.8 1132-2916 36

#### LACERTA

NGC7209 OC 7.7 2205+4630 73  
C16/NGC7243 OC 6.4 2215+4953 73  
8 Lac DS 5.7 2236+3938 72

#### LEO

M65 GX 9.3 1119+1302 34  
M66 GX 9.0 1121+1256 34  
M95 GX 9.7 1044+1139 34  
M96 GX 9.2 1047+1146 34  
M105 GX 9.3 1048+1232 34  
NGC2903 GX 8.9 0933+2128 35  
NGC3384 GX 10.0 1049+1235 34



NGC3521 GX 8.9 1106-0005 34  
NGC3607 GX 10.0 1117+1800 34  
C40/NGC3626 GX 10.9 1121+1818 34  
NGC3628 GX 9.5 1121+1333 34  
alphaLeo DS 1.4 1008+1158 35  
gammaLeo DS 2.2 1020+1951 35  
54 Leo DS 4.5 1056+2445 34

#### LEO MINOR

NGC3003 GX 11.7 0949+3323 33  
NGC3344 GX 10.0 1044+2452 35  
NGC3432 GX 11.3 1023+3634 33

#### LEPUS

M79 GC 8.0 0525-2433 16  
HR1944 DS 6.4 0539-1751 16  
gammaLep DS 3.8 0545-2227 16

#### LIBRA

NGC5897 GC 8.6 1518-2103 57  
alphaLib DS 2.8 1451-1602 57

#### LYNX

C25/NGC2419 GC 10.4 0739+3852 23  
NGC2683 GX 9.7 0853+3323 22  
12 Lyn DS 5.4 0646+5927 23  
19 Lyn DS 5.6 0723+5517 23  
38 Lyn DS 3.9 0919+3648 22

#### LYRA

M56 GC 8.3 1917+3012 63  
M57 PN 9.0 1854+3303 63  
betaLyr DS 3.4 1850+3322 63  
zetaLyr DS 4.3 1845+3736 63  
epsilonLyr DS 5.0 1844+3940 63  
Struve 2404 DS 6.9 1851+1059 63  
O.Struve 525 DS 6.0 1855+3358 63

#### MONOCEROS

M50 OC 5.9 0704-0821 27  
NGC2232 OC 3.9 0627-0445 27  
C50/NGC2244 OC 4.8 0633+0452 25  
NGC2251 OC 7.3 0635+0822 25  
C46/NGC2261 EN 10.0 0639+0844 25  
NGC2264 CN 3.9 0642+0952 25  
C49/NGC2237+ EN — 0631+0503 25  
NGC2301 OC 6.0 0652+0027 25  
NGC2343 OC 6.7 0709-1040 27  
C54/NGC2506 OC 7.6 0801-1048 26  
betaMon DS 4.7 0629-0702 27  
epsilonMon DS 4.5 0624+0436 25

#### OPHIUCHUS

M9 GC 7.9 1720-1831 56  
M10 GC 6.6 1658-0126 56  
M12 GC 6.6 1648-0158 56  
M14 GC 7.6 1738-0315 56  
M19 GC 7.2 1703-2617 56  
M62 GC 6.6 1702-3008 56  
M107 GC 8.1 1633-1304 56  
NGC6369 PN 13.0 1730-2346 56  
NGC6572 PN 9.0 1812+0651 65  
NGC6633 OC 4.6 1828+0634 65  
IC4665 OC 4.2 1746+0543 54  
omicronOph DS 5.4 1718-2417 56  
36 Oph DS 5.1 1715-2636 56  
70 Oph DS 4.2 1806+0230 65

#### ORION

M42 EN 3.9 0536-0527 16  
M43 EN 9.0 0536-0516 16  
M78 RN 8.0 0547+0003 16  
NGC1662 OC 6.4 0449+1057 14  
NGC1788 RN — 0507-0320 16  
NGC1973+ EN — 0535-0444 B  
NGC1981 OC 4.6 0536-0426 16  
NGC2022 PN 12.0 0543+0905 14

NGC2024 EN — 0542-0151 14  
NGC2169 OC 5.9 0609+1357 14  
NGC2194 OC 8.5 0614+1248 14  
betaOri DS 0.1 0515-0812 16  
deltaOri DS 2.2 0532-0018 16  
theta1 Ori DS 5.4 0536-0523 B  
theta2 Ori DS 5.2 0536-0525 B  
iotaOri DS 2.8 0535-0555 B  
lambdaOri DS 3.6 0535+0956 14  
sigmaOri DS 4.0 0539-0236 16  
zetaOri DS 1.9 0541-0157 16  
Struve 747 DS 4.8 0535-0600 B

#### PEGASUS

M15 GC 6.4 2130+1212 75  
C30/NGC7331 GX 9.5 2237+3427 72  
C44/NGC7479 GX 11.0 2305+1222 74  
C43/NGC7814 GX 10.5 0004+1612 74  
epsilonPeg DS 2.4 2144+0952 75

#### PERSEUS

M34 OC 5.2 0243+4249 13  
M76 PN 12.0 0143+5136 13  
C14/NGC869 OC 4.0 0220+5711 13  
C14/NGC884 OC 4.0 0223+5709 13  
NGC1023 GX 9.5 0241+3906 13  
C24/NGC1275 GX 11.6 0320+4133 13  
NGC1342 OC 6.7 0332+3722 13  
NGC1491 EN — 0404+5120 13  
NGC1528 OC 6.4 0416+5115 13  
NGC1582 OC 7.0 0433+4352 12  
Tr2 OC 5.9 0237+5559 13  
Mel20 OC 1.2 0322+4900 13  
etaPer DS 3.8 0251+5554 13  
Struve 331 DS 5.3 0301+5221 13

#### PISCES

M74 GX 9.2 0137+1549 04  
alphaPsc DS 4.2 0202+0246 04  
zetaPsc DS 5.6 0113+0735 05  
psi1 Psc DS 5.6 0106+2128 05  
65 Psc DS 6.3 0050+2743 05

#### PUPPIS

M46 OC 6.1 0742-1450 27  
M47 OC 4.4 0737-1431 27  
M93 OC 6.2 0745-2353 26  
NGC2440 PN 11.0 0742-1814 26  
C71/NGC2477 OC 5.8 0753-3834 28  
NGC2527 OC 6.5 0806-2811 28  
NGC2539 OC 6.5 0811-1251 26  
NGC2571 OC 7.0 0819-2946 28  
kappaPup DS 4.5 0739-2648 27

#### SAGITTA

M71 GC 8.3 1954+1848 64

#### SAGITTARIUS

M8 CN 5.8 1804-2423 67  
M17 EN 6.0 1821-1611 67  
M18 OC 6.9 1820-1708 67  
M20 EN 6.3 1803-2302 67  
M21 OC 5.9 1805-2635 67  
M22 GC 5.1 1837-2354 67  
M23 OC 5.5 1757-1901 67  
M24 SC 4.6 1817-1850 67  
M25 OC 4.6 1832-1915 67  
M28 GC 6.9 1825-2452 67  
M54 GC 7.7 1856-3028 67  
M55 GC 7.0 1940-3057 66  
M69 GC 7.7 1832-3221 67  
M70 GC 8.1 1844-3217 67  
M75 GC 8.6 2007-2154 66  
NGC6445 PN 13.0 1750-2001 67  
NGC6520 OC 8.0 1804-2754 67  
NGC6716 OC 6.9 1855-1952 67

NGC6818 PN 10.0 1944-1408 66  
C57/NGC6822 GX 9.0 1945-1447 66

#### SCORPIUS

M4 GC 5.9 1624-2633 56  
M6 OC 4.2 1741-3213 58  
M7 OC 3.3 1754-3449 58  
M80 GC 7.2 1617-2300 56  
C75/NGC6124 OC 5.8 1626-4041 58  
C76/NGC6231 OC 2.6 1654-4148 58  
C69/NGC6302 PN 13.0 1714-3707 58  
betaSco DS 2.6 1605-1948 56  
nuSco DS 4.3 1612-1928 56  
xiSco DS 4.8 1604-1122 56  
Struve 1999 DS 7.4 1604-1127 56

#### SCULPTOR

C72/NGC55 GX 8.0 0015-3908 78  
C65/NGC253 GX 7.1 0048-2514 07  
C70/NGC300 GX 9.0 0055-3738 09

#### SCUTUM

M11 OC 5.8 1852-0615 67  
M26 OC 8.0 1846-0923 67  
NGC6712 GC 8.2 1854-0841 67

#### SERPENS CAPUT

M5 GC 5.8 1519+0203 55  
deltaSer DS 4.2 1535+1032 55

#### SERPENS CAUDA

M16 CN 6.0 1819-1347 67  
IC4756 OC 4.6 1839+0527 65  
thetaSer DS 4.5 1856+0412 65

#### SEXTANS

C53/NGC3115 GX 9.2 1006-0745 37

#### TAURUS

M1 SN 8.4 0535+2201 14  
M45 OC 1.2 0047+2407 15  
NGC1514 PN 10.0 0410+3048 15  
NGC1647 OC 6.4 OC 0446+1905 15  
NGC1746 OC 6.0 0504+2350 14  
NGC1807 OC 7.0 0511+1633 14  
NGC1817 OC 7.7 0513+1643 14  
C41/Mel25 OC 1.0 0427+1600 15  
chiTau DS 5.5 0423+2538 15  
118 Tau DS 5.8 0529+2509 14

#### TRIANGULUM

M33 GX 5.7 0134+3041 02  
iotaTri DS 5.3 0212+3018 02

#### URSA MAJOR

M40 DS 9.0 1222+5805 32  
M81 GX 6.9 0956+6902 31  
M82 GX 8.4 0956+6939 31  
M97 PN 11.2 1115+548 32  
M101 GX 7.7 1403+5419 42  
M108 GX 10.1 1112+5537 32  
M109 GX 9.8 1158+5320 32  
NGC2841 GX 9.3 0923+5056 33  
NGC3079 GX 10.6 1003+5539 33  
NGC3184 GX 9.8 1019+4123 33  
NGC3877 GX 12.0 1147+4727 32  
NGC3941 GX 11.0 1153+3656 32  
NGC4026 GX 12.0 1200+5055 32  
NGC4088 GX 10.5 1206+5030 32  
NGC4157 GX 12.0 1212+5026 32  
NGC4605 GX 11.0 1240+6134 32  
zetaUMa DS 2.3 1324+5456 32

#### URSA MINOR

alphaUMi DS 2.0 0232+8916 01

#### VELA

C74/NGC3132 PN 8.2 1008-4026

## VIRGO

M49 GX 8.4 1230+0757 C  
M58 GX 9.8 1238+1146 C  
M59 GX 9.8 1242+1136 C  
M60 GX 8.8 1244+1130 C  
M61 GX 9.7 1222+0425 45  
M84 GX 9.3 1226+1250 C  
M86 GX 9.2 1227+1254 C  
M87 GX 8.6 1231+1221 C  
M89 GX 9.8 1236+1230 C  
M90 GX 9.5 1237+1307 C  
M104 GX 8.3 1240-1140 47  
NGC4216 GX 10.0 1216+1306 C  
NGC4388 GX 11.1 1226+1237 C  
NGC4438 GX 10.1 1228+1258 C  
NGC4517 GX 10.5 1233+0004 45  
NGC4526 GX 9.6 1234+0739 C  
NGC4535 GX 9.8 1235+0809 C  
NGC4567/8 GX 11.3 1237+1112 C  
C52/NGC4697 GX 9.3 1249-0551 47  
NGC4699 GX 9.6 1249-0843 47  
NGC4762 GX 10.2 1253+1111 C  
NGC5746 GX 10.6 1445+0155 44  
gammaVir DS 3.5 1242-0127 45

## VULPECULA

M27 PN 8.1 2000+2244 64  
NGC6802 OC 8.8 1931+2017 64  
NGC6823 CN 7.1 1943+2319 64  
C37/NGC6882-5 OC 6.0 2012+2630 64  
NGC6940 OC 6.3 2035+2820 64  
Cr 399 OC 3.6 1925+2011 64

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c76 (the northern jewelbox) in scorpius courtesy of sdss

saber does the stars vol 2: the index catalog  
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## Saber's Beads: Evolution

Saber's Beads: Evolution

by J. Sorenson

"The broken arc of lights eclipse contact resemblance peaked in deep twilight with the infant crescent moon hanging 5° above the horizon on a steep ecliptic at a solar elongation of 12.2°. By this time I was fully immersed in the imagery of a total solar eclipse- as if in the next few moments I would either be basking in our sun's corona or forced to turn away from its glare. Low altitude scintillation added a surreal dynamic to the experience." -Stephen Saber (May 2006)

After his related comment on this young moon sighting, the described visual aspect was almost immediately dubbed "Saber's Beads" by his peers, and gained popular use by other lunar observers and websites.

The term has since continued to virally spread to other cultural venues as well, including:

Existential: SouledOut (2007)

Saber's Beads is represented as symbolic of increased perspective and open-mindedness.

Life Experience: Blogger (2009) The author's blog titled Saber's Beads documents her own personal uplifting experiences as 'staggered brightness peaks' along life's journey.

Literature/Fiction: Cailyn Vature's 'Raven' (2009) Saber's Beads initiate a fabled window of time surrounding new moon that allows those souls in limbo to return to earth.

Music: Sophie Hutchings (2012)

Saber's Beads is released as an instrumental classical piano track appearing on her album 'Night Sky'.

Nature: (Faulkner 2014) A breed of flower is officially catalogued as Saber's Beads due to characteristic random bright patches at the petal tips.

Gaming: Perfect World (2015)

Saber's Beads is introduced as a powerful defensive weapon sought to be collected during play.

Sports: Horse Racing/TabGold (2015) The 3-year old racehorse, named Saber's Beads, takes 3rd place in his first appearance at Scottsville Downs.

Jewelry: Lunerias Luneras (2016)

The Saber's Beads necklace is introduced, featuring detached points of brightness and color.

Music: Malakai (2018) Dance/electronic track Saber's Beads released from the album Soros.

Art/Literature: (2018) Graphic novel Saber's Beads created by artist/writer Melody Borg.

Quotable/Meme (YouQuote.in): Saber's Beads mentioned in inspirational quote by writer Incognito.

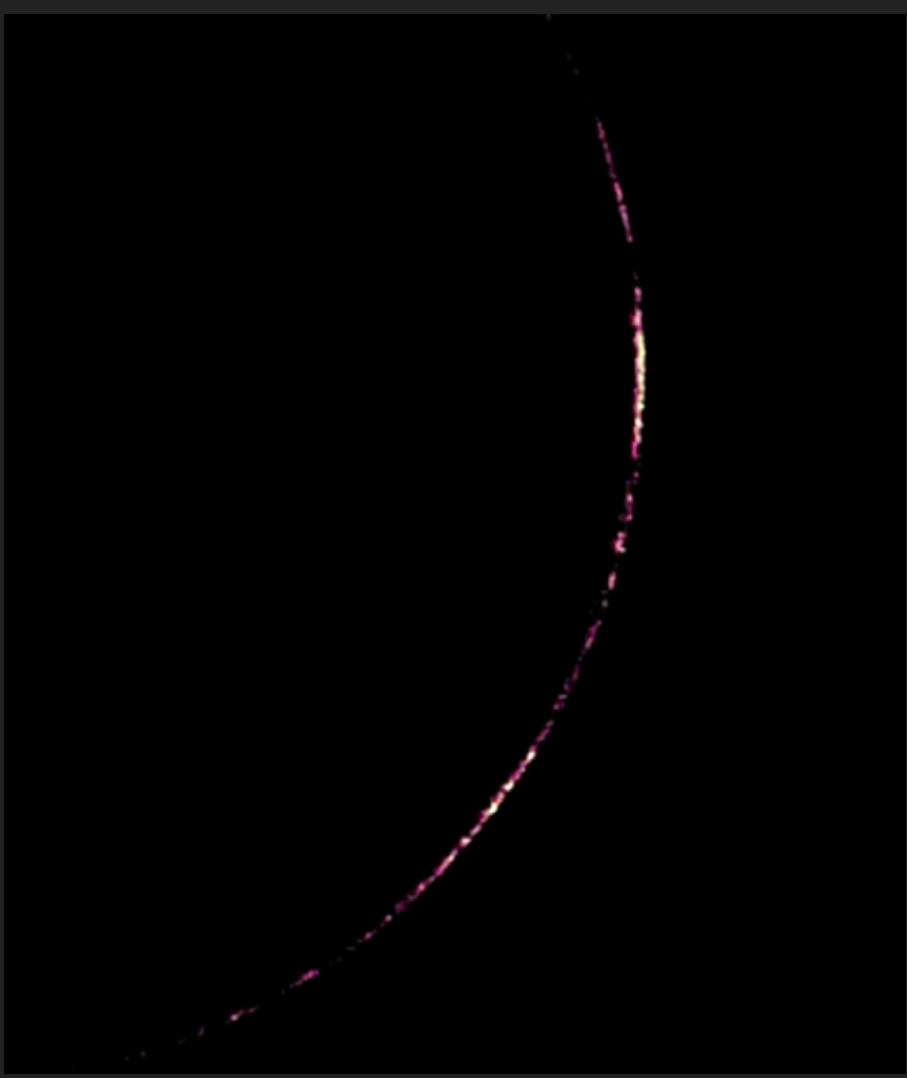
Baby Names (Reddit): Young couple notes naming their firstborn Saber after the rare lunar phenomenon.

Art/Paintings: (2019) French artist Joyce Billet creates the Saber's Beads collection of oil paintings inspired by the 'duality between dark and light alluding to an eclipse' and 'the relationship between nature and humanity'.

Even with Saber's passionate forte for popularizing the night sky, this level of 'outreach gone wild' was an unexpected bonus, and he mentions being especially pleased that the epiphany-related term had not remained confined to the world of astronomy.

For a chance to experience the astronomical Saber's Beads the equipment requirements are as simple as the sighting conditions are serendipitous. Standard binoculars provide the minimum magnification. However, the necessary logistics and sky conditions to follow an extremely young lunar crescent down to a clear horizon (or an extremely old crescent up from the horizon) while still in deep twilight are few and far between. But for those who persevere Saber's Beads remains a beautiful sight not to be missed.

[reprinted with permission/J. Sorenson, KSCA Meridian June 2019]



Saber's Beads (raw image credit: maurice collins/ltvt)

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# C14 Is Awesome!

## One Foot In The Trenches, One Fist In The Stars



Stephen Saber of *Menace* is a self-described journeyman bar band banger from Rock Island, Illinois. He's been armed with Scorpion Percussion 2B drumsticks onstage for many years of his heavy-handed metal drumming, noting that "they're consistently a great combination of balance and durability".

In his free time on a clear night, Saber can also be found unwinding under the stars with a telescope or binoculars. Having earned a Master Observer award from the Astronomical League, he is also namesake to the lunar phenomenon know as Saber's Beads. Coincidentally, his favorite constellation is Scorpius- the Scorpion. Thanks to Saber for his continued support in the Midwest.

Visit Scorpion Percussion at

<https://www.scorpionpercussion.com/>

\*\*\*\*\*

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saber, stargazing, caldwell ally's braid, asterisms, concordiem borealis, deepsky, drummers, m-cubed, mescal, messier marathon from memory, messier-caldwell marathon, musicians, saber's beads, saberscorp

## Messier Marathon from Memory (M-Cubed)

by Stephen Saber

Running the M-Cubed is an advanced approach to the Messier Marathon requiring the observer to already be very familiar with each target's position.

Sharpshooting the Messiers for a few seasons before even hearing of the M-Cubed, my approach included committing the entire sequence to memory. This approach allows more time spent observing while maintaining maximum dark adaptation.

For easier memorization the 110 Messier objects are broken down into 10 groups, each corresponding to a specific area of the sky. Numeric patterns are added whenever possible while still following the basic search sequence.

I have used this technique to manually hunt and observe all 110 Messiers from Arizona, and 109 on four occasions from 41°N latitude without the aid of starcharts, notes, or red light. Very liberating. Begin by memorizing the first string of numbers while visualizing their positions. As you become comfortable with these, repeat the process for the subsequent groups.

Evening Rush

74, 77, 33, 31, 32, 110, 52, 103, 76, 34, 45

Southern Comfort

79, 42, 43, 78, 50, 41, 93, 46, 47, 48

Early Ecliptic

1, 35, 37, 36, 38, 44, 67, 95, 96, 105, 65, 66

The Big Bear

81, 82, 97, 108, 109, 40, 106, 94, 63, 51, 101, 102

Downtown Virgo

98, 99, 100, 85, 84, 86, 87, 88, 91, 90, 89

Virgo and the 'Burbs

58, 59, 60, 49, 61, 64, 53, 3, 104, 68, 83

Easy East

5, 13, 92, 57, 56, 39, 29, 27, 71

Got Globulars?

12, 10, 14, 107, 9, 4, 80, 62, 19

Cruising the Milky Way

11, 26, 16, 17, 18, 24, 25, 23, 21, 20, 8, 28, 22

Homestretch

6, 7, 69, 70, 54, 55, 75, 15, 2, 72, 73, 30

With repetition the individual strings will eventually link together as the entire search sequence is committed to memory. (note: the strings' titles are by no means written in stone, and can be substituted for any phrase the observer finds mnemonically helpful. also, the classic m-cubed only requires memorization of the target positions- not the search sequence.)

I encourage those interested in attempting this method to practice with mini-M-Cubes throughout the year, going over each leg in sections.

Many end up suprised by the number of object locations that are already familiar outside of their chart and starhopping routine.

[Left Ascension, Feb '04]

\*\*\*\*\*

saber does the stars (vol 2: the index catalog)

[www.c14isawesome.blogspot.com](http://www.c14isawesome.blogspot.com)

[www.saberdoesthestars.wordpress.com](http://www.saberdoesthestars.wordpress.com)

sed's messier marathon homepage <http://messier.seds.org/xtra/marathon/marathon.html>

all contents within are free use with author/website acknowledgement

\*m1 (the crab nebula) courtesy of sed's\*



No comments:



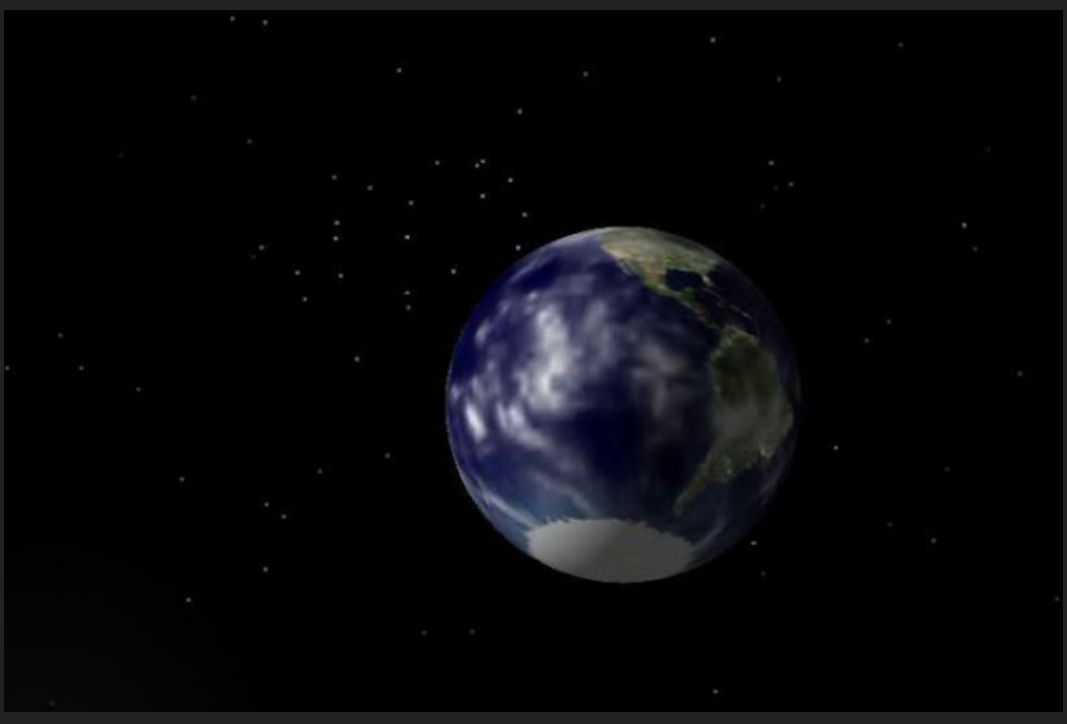
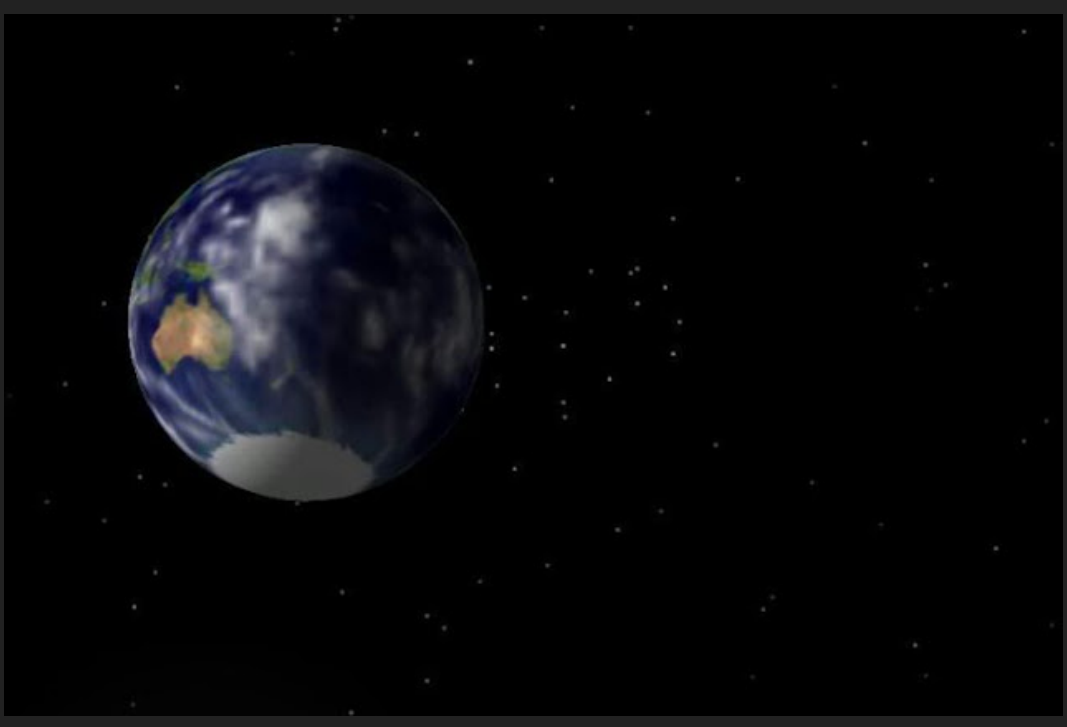
saber, stargazing, caldwell astronomy, deepsky, m-cubed, messier marathon, saber does the stars, saber's beads, stargazing, stephen saber

## sitting in plato: earth viewed from the moon

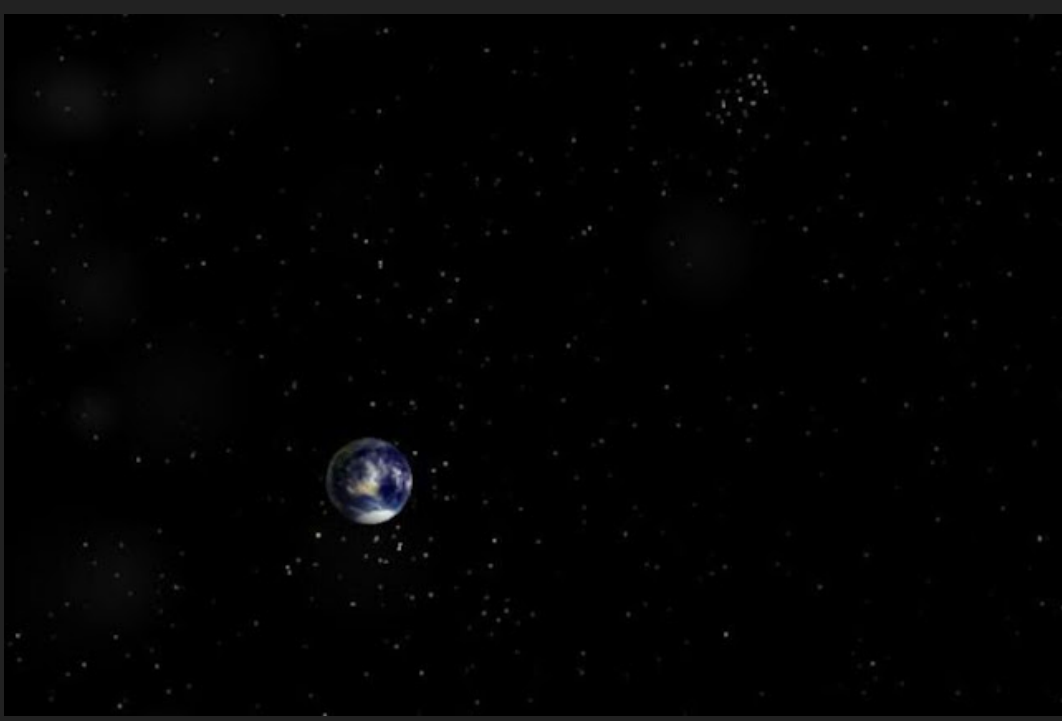
simulated pics of earth as seen from the lunar crater plato \*created with celestia\*

earth occults the pleiades (m45)





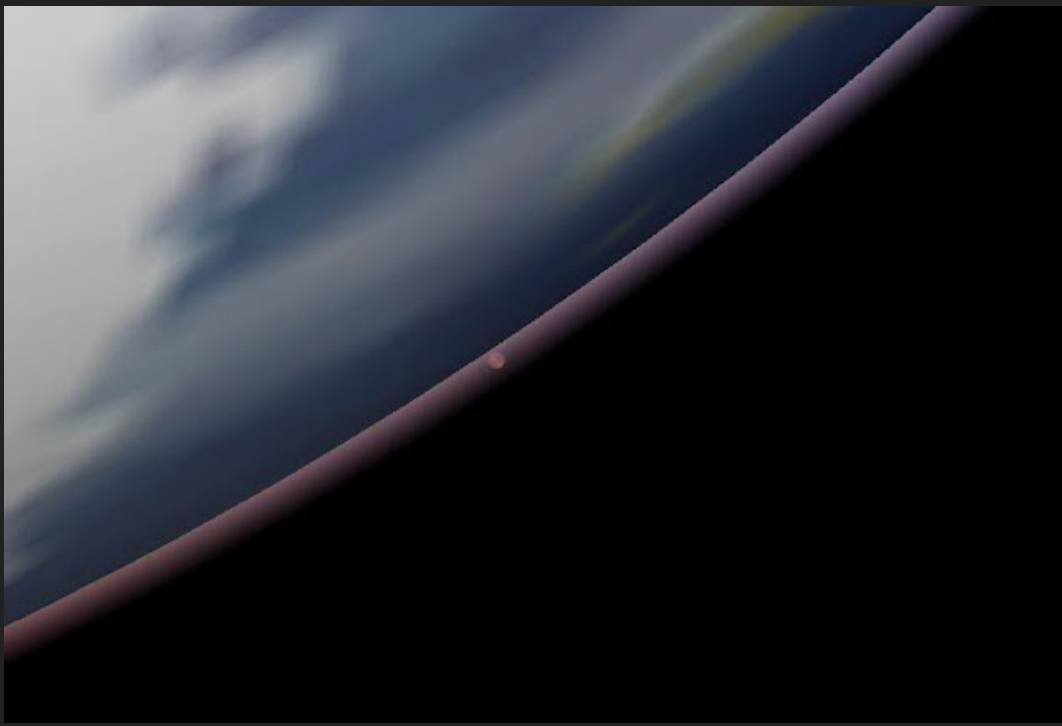
earth passes the hyades (caldwell 41)



earth occults saturn



earth occults mars



earth occults sol (total solar eclipse)

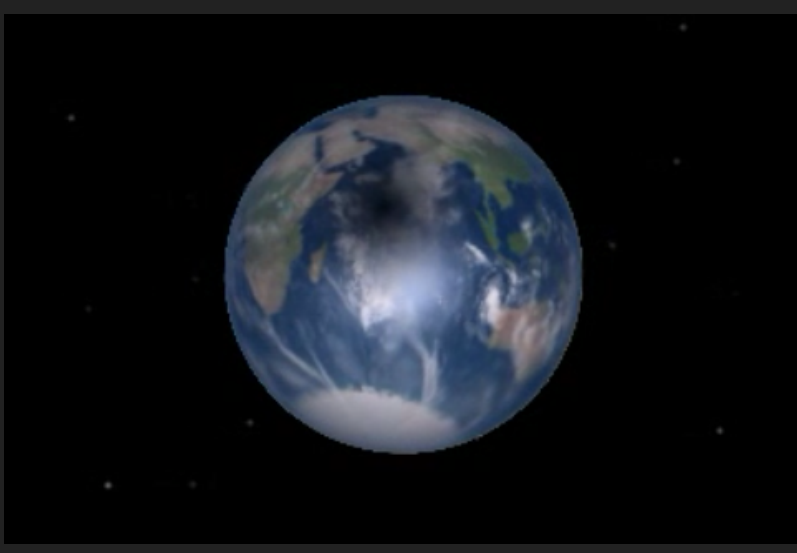






a total solar eclipse from earth is seen as a shadow transit from the moon

full shadow transit vidclip at  
<http://www.saberscorp.x.vidmeup.com>



\* \* \* \* \*

<http://c14isawesome.blogspot.com>  
<http://saberdoesthestars.wordpress.com>



No comments:



saber, stargazing, caldwell astronomy, binoculars, clinton, earth, hyades, mars, moon, obama, outreach, plato, pleiades, saber does the stars, saber's beads, saturn, stargazing, stephen saber, sun, telescopes, trump

## best colorful doublestars in the northern sky



by stephen saber

i'm mostly a deepsky guy, but fortunately i also developed a comparable obsession with planetary, lunar, and doublestar study. this saved my mental health on countless nights of less-than-galaxy-class skies. the abundance of doubles make them a particularly satisfying complement to dso hunting.

the following gems all have secondaries brighter than 8th mag. most are obvious enough not to need position angles to locate. the corresponding pocket sky atlas chart numbers are included. apparent colors can vary depending on sky conditions, contrast, magnitude difference, color sensitivity, and aperture used. enjoy!

gamma And 0204+4219 mag 2.3, 5.5 @ sep 9.7" orange and blue (psa 02)

12 Aqr 2104-0549 5.8, 7.5 @ 2.5" yellow and blue (77)

94 Aqr 2319-1327 5.3, 7.3 @ 13.0" red and light blue (76)

107 Aqr 2346-1840 5.4, 5.7 @ 7.0" white and blue (76)

1 Ari 0150+2216 5.8, 7.1 @ 2.8" white and blue/green (04)

gamma Ari 0154+1917 4.6, 4.7 @ 7.6" orange and blue/green (04)

lambda Ari 0158+2336 4.8, 7.6 @ 37.5" yellow and blue (04)

30 Ari 0237+2439 6.2, 7.2 @ 39" yellow and blue (04)

stf872 Aur 0616+3609 6.0, 7.0 @ 11.3" gold and blue (12)

14 Aur 0515+3241 5.4, 7.5 @ 14.0" yellow and orange (12)

epsilon Boo 1445+2704 2.5, 4.9 @ 2.8" yellow/orange and blue (53)

xi Boo 1451+1905 4.7, 7.0 @ 6.9" yellow and red (55)

beta Cap 2021-1446 3.2, 6.2 @ 205" orange/yellow and blue (66)

sigma Cas 2359+5545 5.0, 7.1 @ 3.1" blue and blue/green (03)

stf3053 Cas 0003+6606 5.9, 7.3 @ 15.2" orange and white (01)

eta Cas 0049+5749 3.7, 7.5 @ 12.8" yellow, white, red (03)

iota Cas 0229+6724 4.6, 6.9 @ 2.5" white, orange triple (01)

beta Cep 2129+7034 3.2, 7.9 @ 13.3" white and blue (71)

delta Cep 2229+5824 3.9, 6.3 @ 41" orange and blue (71)

stf2816 Cep 2139+5729 5.7, 7.5 @ 11.7" triple with stf2819 (73)

iota Cnc 0847+2845 4.2, 6.6 @ 30" yellow/gold and blue (24)

h3945 CMa 0717-2319 4.8, 6.0 @ 26.8" orange and blue (27)

17 Com 1229+2554 5.4, 6.7 @ 145" white and blue (45)

24 Com 1235+1822 5.2, 6.7 @ 20.3" gold and blue (45)

zeta Crv 1221-2218 5.2, 5.9 @ 5.9'  
blue and gold (47)

zeta CrB 1539+3638 5.1, 6.0 @ 6.3" white and blue (53)

alpha CVn 1256+3818 2.9, 5.8 @ 19.4" blue and white (32)

beta Cyg 1931+2757 3.1, 5.1 @ 34.4" blue and gold (62)

31 Cyg 2014+4644 3.8, 4.8 @ 107" orange, blue, blue (62)

52 Cyg 2046+3043 4.3, 5.0 @ 6.5" yellow and orange (62)

gamma Del 2047+1607 4.3, 5.2 @ 9.3" yellow and blue/green (64)

omicron Dra 1851+5923 4.5, 7.5 @ 34.2" orange and blue (63)  
 32 Eri 0354-0257 4.7, 6.2 @ 6.8" yellow and blue/green (17)  
 38 Gem 0655+1311 4.7, 7.7 @ 7.1" white and orange (25)  
 alpha Her 1715+1423 3.2, 5.4 @ 4.7" orange and blue/green (54)  
 kappa Her 1609+1703 5.3, 6.5 @ 28" yellow and orange (55)  
 95 Her 1802+2135 5.0, 5.1 @ 6.3" orange and blue/green (65)  
 tau1 Hya 0929-0246 4.6, 7.2 @ 66" white and blue (37)  
 gamma Leo 1020+1950 2.5, 3.5 @ 4.4" yellow and gold (35)  
 tau Leo 1128+0250 5.2, 7.0 @ 90" yellow and blue (34)  
 gamma Lep 0545-2227 3.8, 6.5 @ 95" yellow and red (16)  
 zeta Lyr 1845+3736 4.3, 5.9 @ 44" red and blue/green (63)  
 shj282 Lyr 1855+3358 6.1, 7.7 @ 45" yellow and blue (63)  
 beta Mon 0629-0702 4.6, 5.0, 5.4 @ 6.9, 2.8" (27)  
 epsilon Mon 0624+0435 4.4, 6.7 @ 12.4" red and blue/green (25)  
 omicron Oph 1718-2417 5.2, 6.6 @ 10.3" yellow/orange and blue (56)  
 70 Oph 1806+0230 4.2, 6.0 @ 4.0" yellow and orange (65)  
 sigma Ori 0539-0236 4.0, 6.5, 7.5, 10.0 @ 12.9, 11.5, 42" (16)  
 varied shades of blue  
 eta Ori 0524-0224 3.4, 4.9 @ 1.7" white and blue (16)  
 42/45 Ori 0536-0450 4.6, 5.2 @ 4.2'  
 blue and yellow (16)  
 iota Ori 0535-0554 2.8, 7.0 @ 11.3" white and blue/green (16)  
 alpha Sco 1630-2626 1.0, 5.4 @ 2.6" orange and blue (56)  
 beta Sco 1605-1948 2.6, 4.9 @ 13.7" with omega sco (56)  
 zeta Sco 1655-4223 3.6, 4.7 @ 6.5'  
 orange and blue (58)  
 theta Tau 0429+1558 3.4, 3.8 @ 5.6'  
 blue and gold (15)  
 iota Tri 0212+3018 5.3, 6.9 @ 3.9" yellow and blue (02)





[albireo and 31cyg courtesy of sdss]

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)

No comments:



saber, stargazing, caldwell astronomy, binoculars, clinton, double stars, obama, saber does the stars, saber's beads, stargazing, stephen saber, telescopes, trump

## Give a Hoot: C13



caldwell 13 in cassiopeia  
\*courtesy of sed\*

C13 (aka ngc 457) has many nicknames including the Kachina Doll, E.T., Owl, and Jet Fighter cluster. It's also not a stretch to see it as Sir Patrick sporting his shiny monacle, as it's one of the best non-Messiers in his Caldwell catalogue. At magnitude 6.4, the rich open cluster is also the brightest in Cassiopeia [radec 0119+5820 psa 01]. Of note, C13's brightest sun, phi Cas, is actually an unrelated foreground star that just happens to be in our line of sight to the rest of the 7900 ly distant cluster.

Residing in the northern circumpolar sky has alot to do with its popularity and varied descriptions, and its orientation on ones first view tends to leave the strongest impression (my own first C13 experience happened to catch the cluster in Jet Fighter mode).

Discovering these multiple 'personalities' also speaks to the benefits of observing all of our treasures at different aspects as they rotate during their trek through the sky.

(btw- herschel 400 hunters can also log ngc 436, the more modest 'mouse' cluster, found in c13's neighboring fov either escaping the owl's claws or directly in the jet's gunsights.)

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)

\*\*\*\*\*

No comments:



saber, stargazing, caldwell astronomy, C13, caldwell catalogue, herschel 400, ngc 457, outreach, saber's beads, stargazing, stephen saber

## addiction

before, the sky was where rain and sunshine came from, and the sun and moon had these eclipse thingies every once in a while. all the stars pretty much looked the same. i rarely took notice of anything up there.

now, my obsession has instilled a vast sense of duty, pride, and shared ownership toward the sky. a part of me is always conscious of it. like i'm responsible for the entire dome's upkeep, inspection, and promotion. i'm aware of the radec grid, moon, planets, bright stars, constellations, and many deepsky treasures' positions above and below the horizon, day or night, indoors or outdoors. ghostly red finder dots are superimposed among the stars, landmarks of repeatedly drawing a bead on the otherwise invisible wonders littering the night sky. and these are just the involuntary effects.

all this because i wanted to show a girl the star i had 'bought' for her (but that's another story).

stargazing can be a powerful drug. be careful what you ask for.

peace, stephen.

\*\*\*\*\*

[tinyurl.com/saberdoesthestarz](https://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](https://tinyurl.com/c14isawesome)



No comments:



saber, stargazing, caldwell astronomy, outreach, saber's beads, stargazing, stephen saber

## Melotte 20: The Scoop On Mirfak



radec 0327+4848 psa 02, 13

specifically, i see the cradle (xistera) used in the 1982's *tron* grid jai-alai game, with mirfak as the shimmering ball (cesta).

or is it just an ice cream scoop?

mel20, aka the alpha persei association, has a combined mag of 1.2, spans over 3°, and consists of some 50 stars. still, this often-unsung treasure has the misfortune of competing for attention with nearby powerhouses like c14/double cluster, c41/hyades, and m45/pleiades. generally considered best in binoculars, i equally enjoy scoping-out the many doublestars residing within the asterism.

my deepsky obsession began in perseus, so i never miss a chance to throw glass at this subtle and beautiful stellar pattern.

\*raw image credit: sdss\*

No comments:



saber, stargazing, caldwell asterisms, astronomy, binoculars, caldwell, deepsky, dso, perseus, stargazing, stephen saber, telescope

## sharpshooting: caldwell 7



at magnitude 8.9, caldwell 7 (aka ngc 2403) is the brightest of the non-messier galaxies. in fact, most do a double-take on their first sighting, wondering how this beauty managed to evade chuck's scrutiny. c7's nickname 'the island universe' comes from its isolation among the realm of dim suns comprising the constellation camelopardalis.

but to draw an rdf bead on c7 we'll start at the nose of the big bear asterism in ursa major. muscida (1 uma, mag 3.3) is the vertex of a slightly flattened triangle, with c7 and 23 uma (mag 3.7) forming the base. to more easily relate its position i've shown a july-ish, right-side up bear, but midnight culmination for c7 is actually in mid-january when our bear is almost upside-down (at which time the galaxy can also be found roughly 25° directly above polaris). the famous galactic pair m81/82 are its closest bright kin, so they're a good jumping-off point to throw some glass and appreciation at the island universe as well.

happy hunting!



caldwell 7 forms a triangle with muscida and 23 uma

(photo credit: dss/chart credit: mobile obs)

\*stephen saber/saber does the stars/2004-2019/all contents within are free use and may be reprinted with author acknowledgement\*

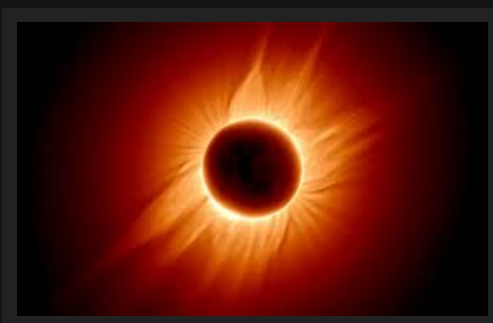
No comments:



saber, stargazing, caldwell binoculars, caldwell catalogue, deepsky, dso, ngc 2403, saber does the stars, saber's beads, starhopping, stephen saber, telescopes

## 2017 and 2024 Total Solar Eclipses: This Is Getting Too Easy

Both eclipse paths intersected a few hours drive from me in southern Illinois. This could spoil a guy. The friend I visited for the events had both totalities run a path directly through her backyard. Why be an eclipse chaser when the eclipses chase you? Enjoying the show, Stephen.



\*solar corona courtesy of eclipsed.com\*



\*map courtesy of accuweather.com\*

also see:

Saber does The Stars

C14 Is Awesome!

POV Astro Vids

\*\*\*\*\*

No comments:



saber, stargazing, caldwell 2017, eclipse, google map, outreach, saber does the stars, saber's beads, stephen saber

## prettiest globular?



c106 (47 tucanae/ngc 104) in tucana  
\*courtesy of seds\*

if i had my choice of hot globs to take to the prom it would easily be 47 tucanae (aka c106/ngc104). wonderful symmetry and resolution gradient. love her sexy aussie accent, too.

the great hercules cluster (m13/ngc6205) and omega centauri (c80/ngc5139), while blatantly impressive, are more about brute strength impact, and would be my first choices if i were hiring, say, nfl linemen.

the 4th magnitude southern showpiece cluster escorts our neighboring galaxy- the small magellanic cloud- across the sky, and culminates in september at radec 0024-7205 (psa 80).

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)  
[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)

\*\*\*\*\*

No comments:



saber, stargazing, caldwell astronomy, caldwell catalogue, deepsky, outreach, saber does the stars, saber's beads, stargazing, stephen saber

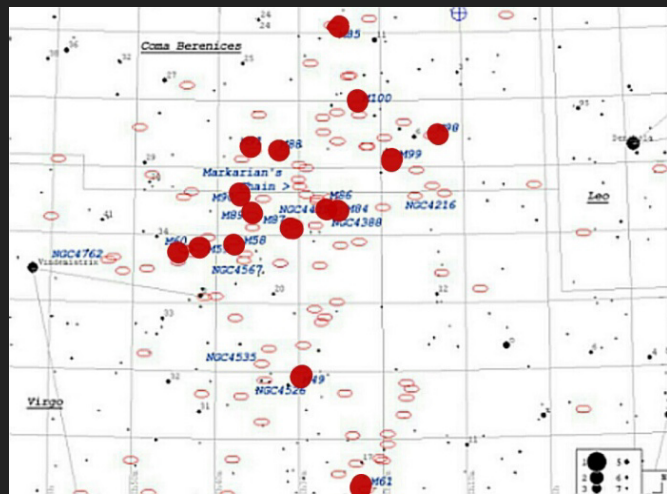
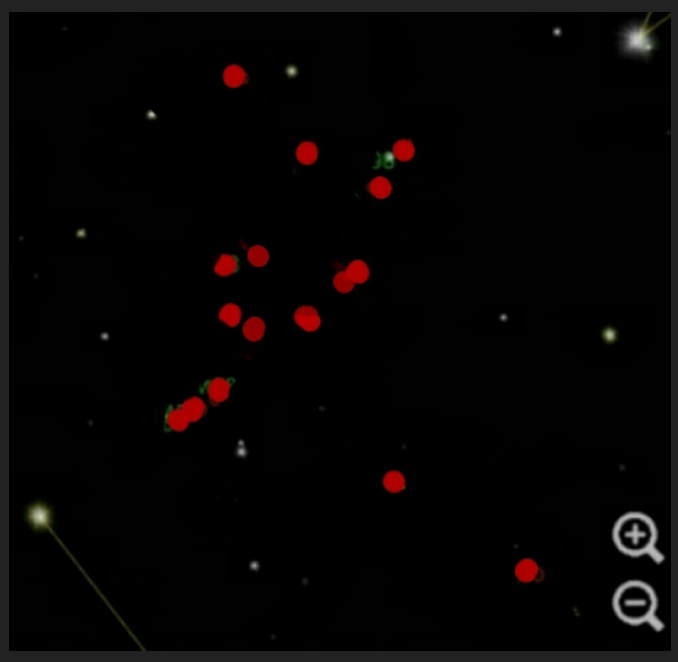
## Messier Reunions/M-Cubed

by **stephen saber**

an annual 'marathon' seems to scare some amateurs off, or just makes it sound like too much work. 'messier reunions' might have a more inviting and celebratory feel to it. of course, there are those who dread reunions as well; the bratty kids (virgo cluster), the weird uncle (m73), the daughter who has a hot date and can't wait to get out of there (m74), the black sheep (m30), et al.

speaking of the bratty kids, a question arose about difficulties sharpshooting the virgo galaxies while running my m-cubed 'naked' (without lists, charts, redlight, etc.). there are red dot patterns i visualize between denebola and vindemiatrix that have their assigned numbers (most maps are too cluttered in this area to give pattern recognition a chance). plus there are only 3-4 galaxies in the entire area that even compete for brightness. i guess i take it for

granted as the collective pattern is burned into my brain, but i'll take a shot at showing what i 'see' in a dark sky (i fingerpainted this with my mobile's pic tweak tool so cut me some artistic slack), and the same rdf bullets fired into a crowd. m84/86 are close to midway between denny and vin. note the crude backwards checkmark starting at 6 com, and even cruder coathanger to the southeast.

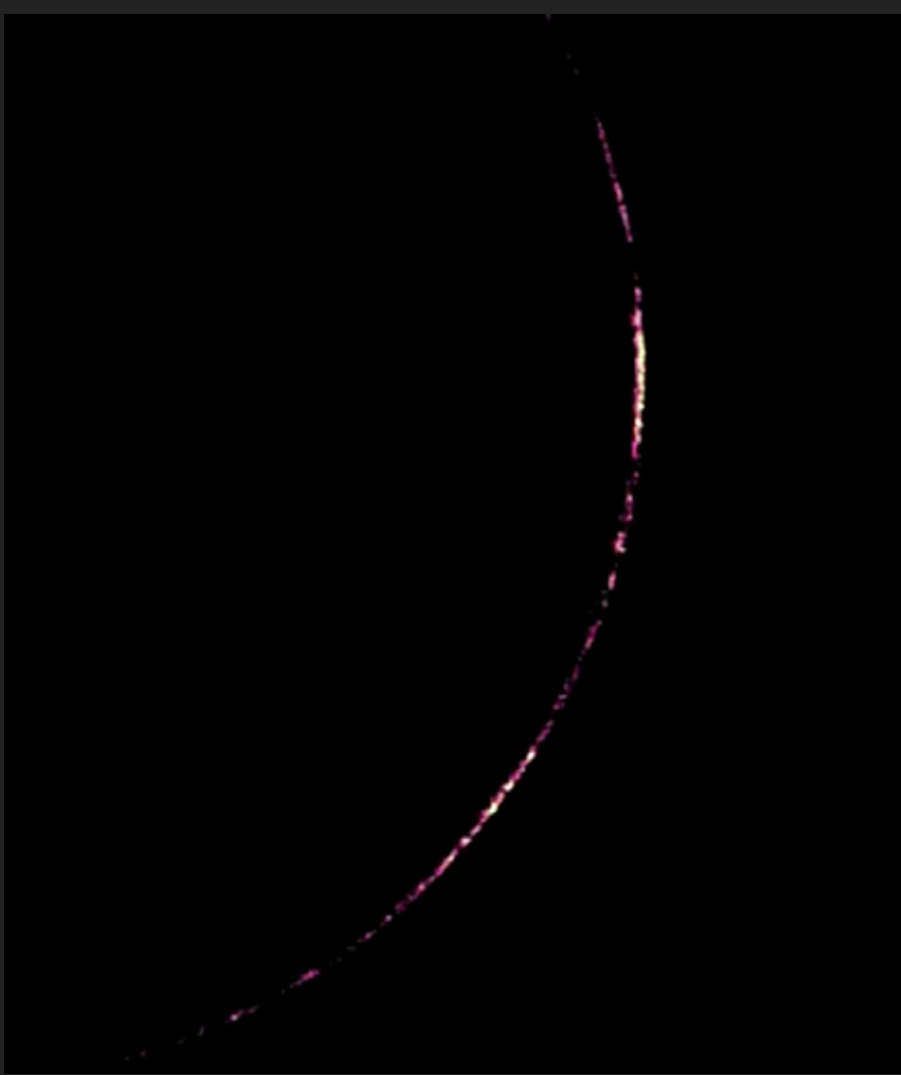


No comments:



saber, stargazing, caldwell asterisms, astronomy, binoculars, concordium borealis, deepsky, dso, galaxies, m-cubed, messier marathon from memory, saber does the stars, saber's beads, stargazing, telescopes

## Extreme Crescent Hunting



*Saber's Beads: The 'string of pearls' illuminated arc of lunar peaks prior to the first complete crescent. Note the striking resemblance to the moments before and after a total solar eclipse. (27 May 2006. age +20.1 hrs. raw image credit: maurice collins/lvt)*

The moonrise before and moonset after each New Moon offer stargazers the opportunity to view the thinnest lunar crescents. There are many websites and apps that provide exact moonrise/set data for any location. Here are some additional tips to maximize your chances of sighting our very young (or old) moon.

Set up at a site with as much altitude as possible overlooking an unobstructed horizon.

Optimal sky transparency allows the crescent to be detected and tracked down to, or up from, the horizon.

Using a telescope or binoculars (mounted binos are recommended), fine tune the focus on Venus, Jupiter, or one of the brighter stars beforehand.

For dusk attempts, have Sol's setting azimuth on hand- making note after sunset of a random landmark at that position for reference- as well as Luna's altaz position at sunset thru moonset.

Accordingly, for dawn attempts, have Luna's altaz info for moonrise thru sunrise.

As dawn slivers have the advantage of possible detection with dark-adapted eyes, wearing sunglasses during the day prior to sunset attempts is recommended for maximum 'dusk' adaptation.

Once the crescent is acquired in binoculars, walk the bino down to the horizon/random landmark in consecutive FOVs for the approximate naked-eye altaz.

A favorable elongation is important. In the 24 hours before or after New Moon, Luna's angular separation from Sol can vary by several degrees. With a favorable ecliptic, net elongations (as altitude) of  $6^\circ$  or more at sunset or moonrise offer the best window for detection.

Observers nearer to the equator than the poles enjoy a much greater frequency of steep ecliptics.

Illuminated fractions of same-age crescents within 24 hours of New Moon can vary by 200% and a full magnitude of brightness due to distance, libration, and sun angle. Slivers near perigee help present a thicker and brighter lunar profile for personal record crescent spotting.

Last but not least, don't always count-out a shallow ecliptic. Occasionally our moon's extreme northern or southern declination will compensate for a less than favorable ecliptic angle.

#### BRACKETING THE SLIVERS

Another rare and challenging notch for ones lunar bedpost is to catch the consecutive waning and waxing crescents within 24 hours on each side of New Moon.

For example, the July 2008 Buck Moon offered such an opportunity as I was able to spot both the -16.5 hour illumination before sunrise on the 2nd and the +23.5 hour sliver just after sunset on the

3rd.

Clean horizons for both windows is a gift in itself.

## SABER'S BEADS

The 'holy grail' of extreme crescent hunting is to catch the segmented arc of illuminations occurring before and after the first and last complete crescent.

Personal research of 100+ sighted thin crescents (at 2% or less illumination) and several hundred simulations indicate additional favorable parameters to sight this aspect include that our moon ideally be revealing a 1.4% or less illumination while traveling on a neutral or northern ecliptic declination, while also showing a strong south and east libration.

It's a rare alignment of cycles, but the visual aspect can now be more realistically simulated and predicted with the advancement of LRO-based programs and apps.

On the plus side, the full necklace of Saber's Beads can potentially be sighted on crescents within about 30 hours of New Moon (within 20-24 hours generally provides the most beading observable in a darker/deep twilight sky).

[exerpt from Saber Does The Stars by Stephen Saber]

<http://c14isawesome.blogspot.com>

<http://saberdoesthestars.wordpress.com>

<http://saberscorp.xvid.meup.com>

\* \* \* \* \*

No comments:



saber, stargazing, caldwell astronomy, binoculars, chicago, crescent, drummer, moon, musician, new moon, saber does the stars, saber's beads, stargazing, stephen saber, telescopes, thinnest crescent, twilight, youngest crescent

## waning interest: hunting the oldest crescent moon

if you're into chasing thin crescents and not taking advantage of the waning slivers, you're missing half of the challenge and rewards. dawn crescents don't get nearly the attention of their dusk counterparts. there is no cultural significance and most of the world is still asleep. this is unfortunate as oldest crescents usually enjoy cleaner, steadier air, and observers already have a jump on dark adaptation. catching the thin horn of luna's limb emerging from the horizon can also be an addictive twist to the dusk event. the still of the night also lends itself to creating a more peaceful and contemplative experience.

double your pleasure, practice, and conquests- support your oldest crescents.

peace, stephen

\*\*\*\*\*

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)



No comments:



saber, stargazing, caldwell astronomy, moon, outreach, saber does the stars, saber's beads, stargazing, stephen saber

## C20: The North America Nebula





**Caldwell 20 (aka n.g.c. #7000)**

**Nebula in Cygnus**

**radec 2059+4432 psa 62**

Despite the 4th mag brightness optimism, C 20 requires both very transparent and steady dark skies to reveal itself at 1x. My first naked-eye view of the fuzzy continent and gulf of mexico was one of the many 'double-take' moments that accumulate from repeated observing; like the first time seeing obvious red in M 42, or noticing your shadow being cast by venus' light alone.

\*\*\*\*\*

**a.i. caldwell catalog observe program**

<https://www.astroleague.org/caldwell-observing-program-introduction/>

**hubble's caldwell catalog**

<https://www.nasa.gov/content/goddard/hubble-s-caldwell-catalog>

**the caldwell catalog: a gift from an icon**

<http://www.tinyurl.com/giftfromanicon>

**also see**

<http://www.tinyurl.com/c14isawesome>

<http://www.tinyurl.com/saberdoesthestarz>

<http://www.youtube.com/saberzastrovidz>

**\*raw image credit: sdss\***

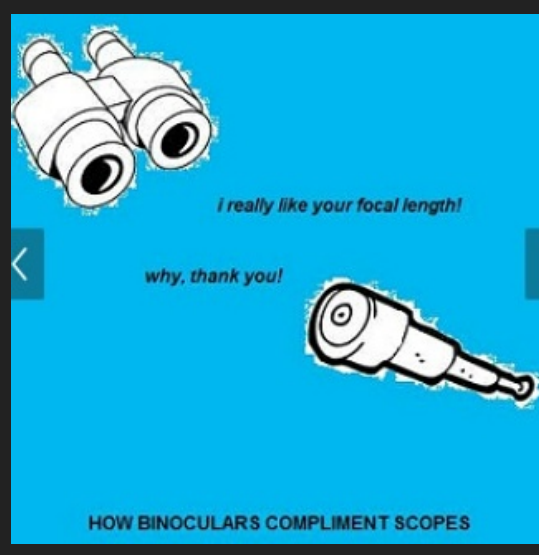
***related searches: astronomical league, seds, nasa, hubble's caldwell catalog, messier-caldwell marathon, m-cubed, messier marathon from memory, deepsky lists/concordiem borealis, stephen saber, saber does the stars, saber's beads, c14 is awesome, saberscorp***

No comments:



saber, stargazing, caldwell astronomical league, astronomy, binoculars, caldwell catalog, concordiem borealis, deepsky, dso, herschel 400, messier marathon from memory, messier-caldwell marathon

**how binoculars compliment scopes**



as a rule, i've never been the type to mention anyone's mistakes in grammar as long as i know what they meant to say. but this is what comes to mind whenever i see 'complement' misspelled in this popular stargazing adage. (actually, i hope all my obs equipment get along this well with each other.)

peace, stephen

[tinyurl.com/saberdoesthestarz](http://tinyurl.com/saberdoesthestarz)

[tinyurl.com/c14isawesome](http://tinyurl.com/c14isawesome)

\*\*\*\*\*

No comments:

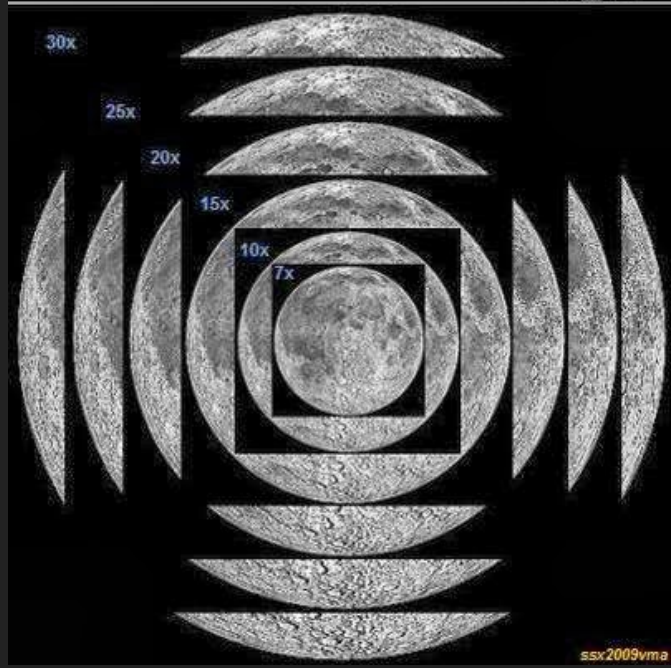
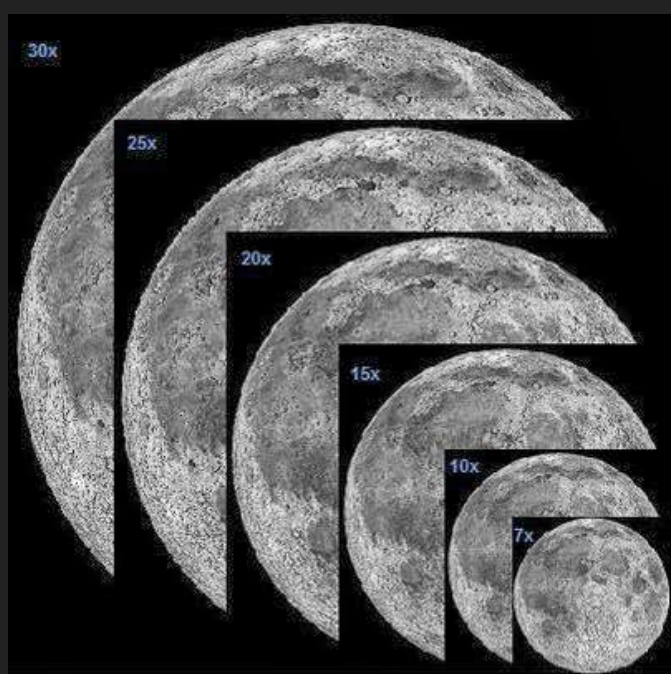


saber, stargazing, caldwell astronomy, binoculars, outreach, saber's beads, stargazing, stephen saber, telescopes

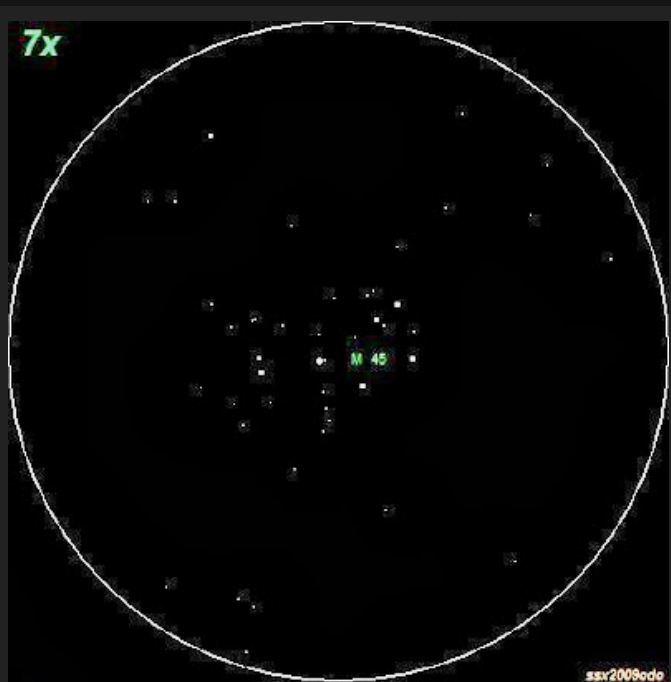
## Quick and Dirty Binocular Mag Comparisons

by stephen saber

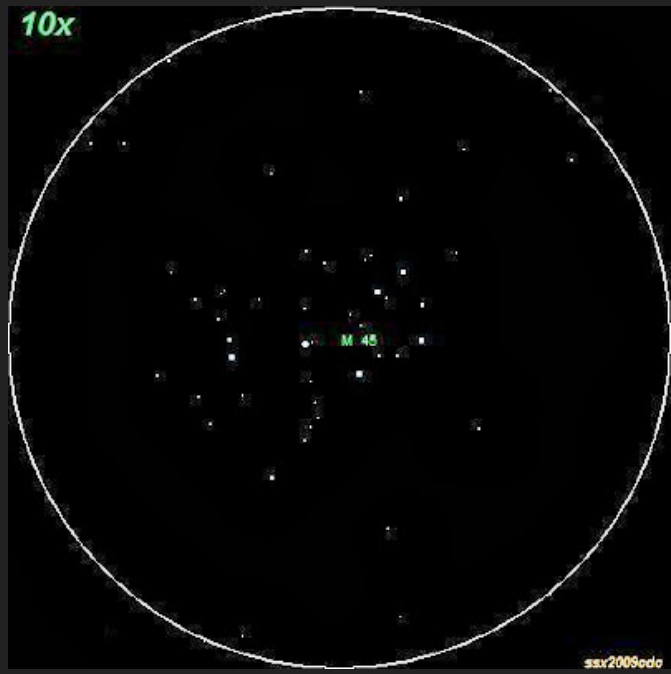
first, a couple for lady luna. couldn't decide which one i liked better. top one has a pac-man thing going on. for image scale purposes only. resolution increases proportionately in higher mag noks.



m45/pleiades

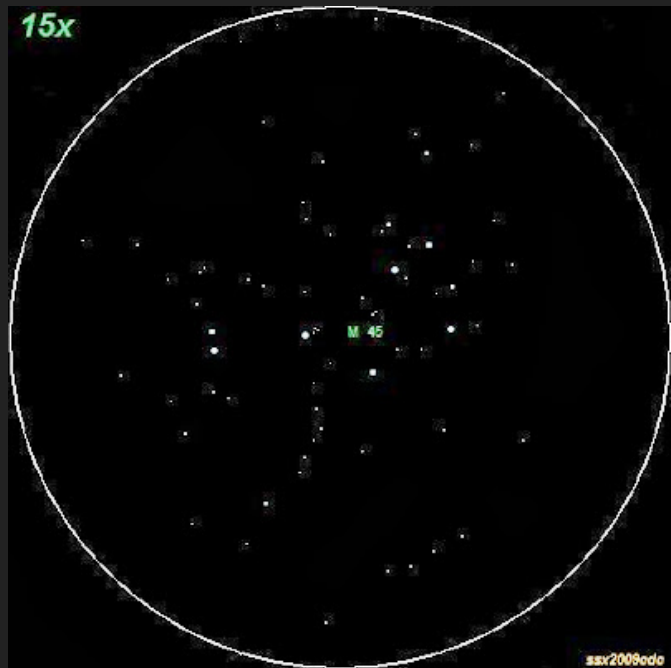


10x



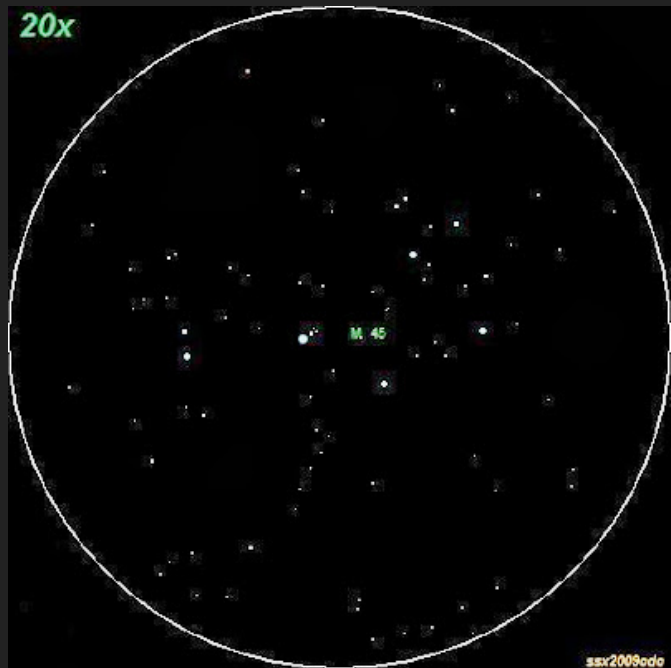
ssv2009odo

15x



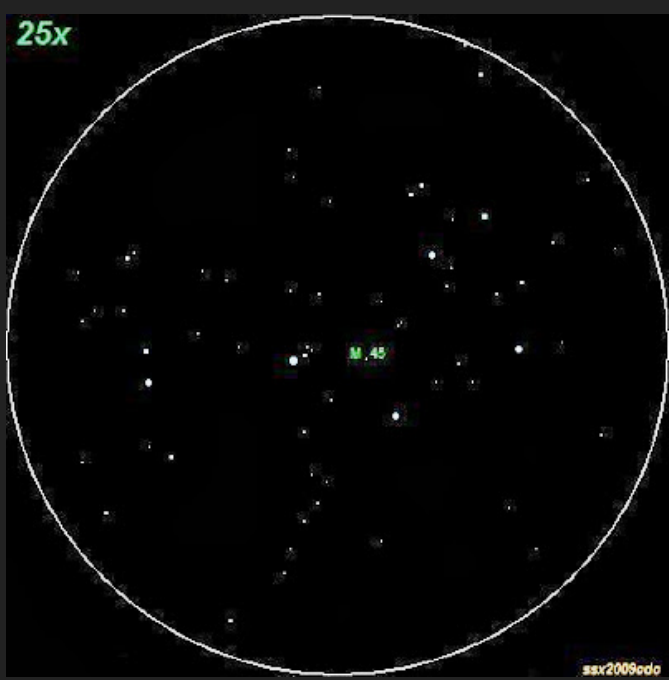
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20x



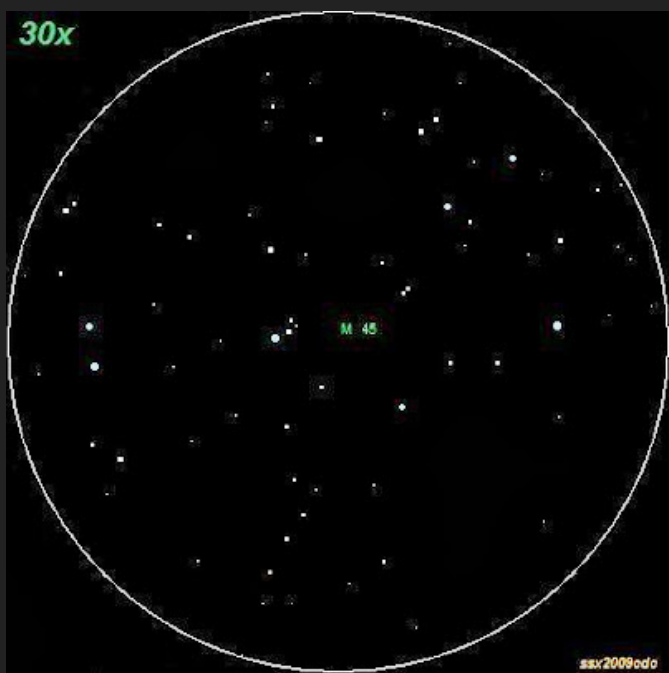
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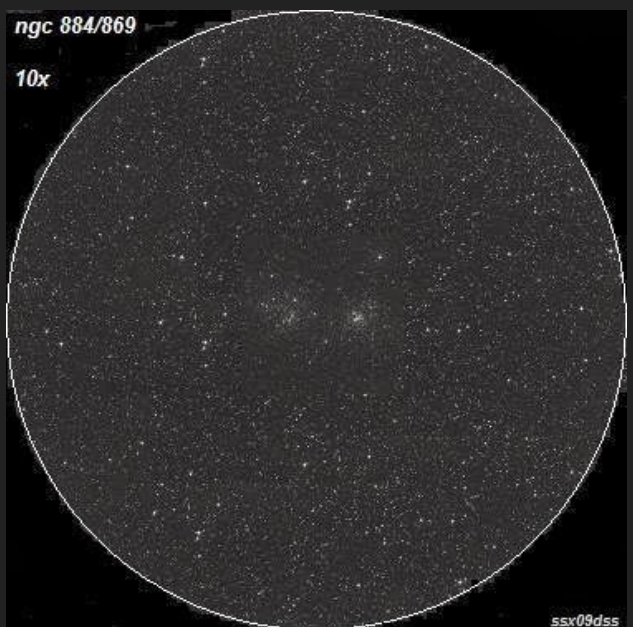


ssx2009edo

c14 is awesome!

ngc 884/869

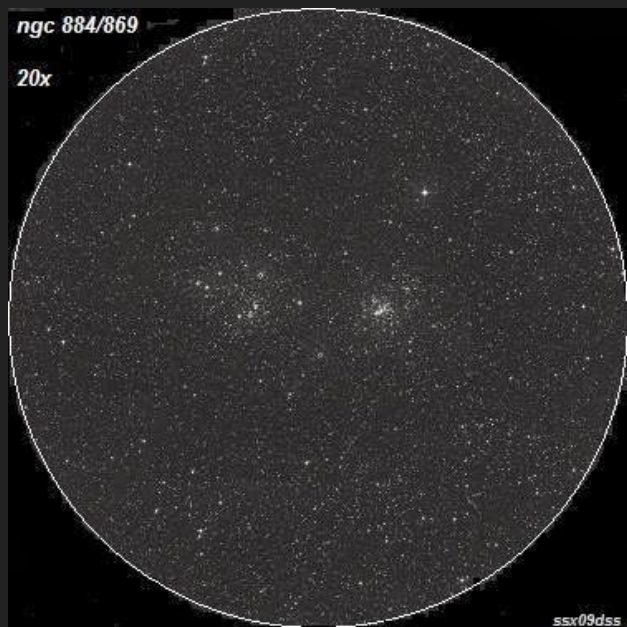
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ngc 884/869

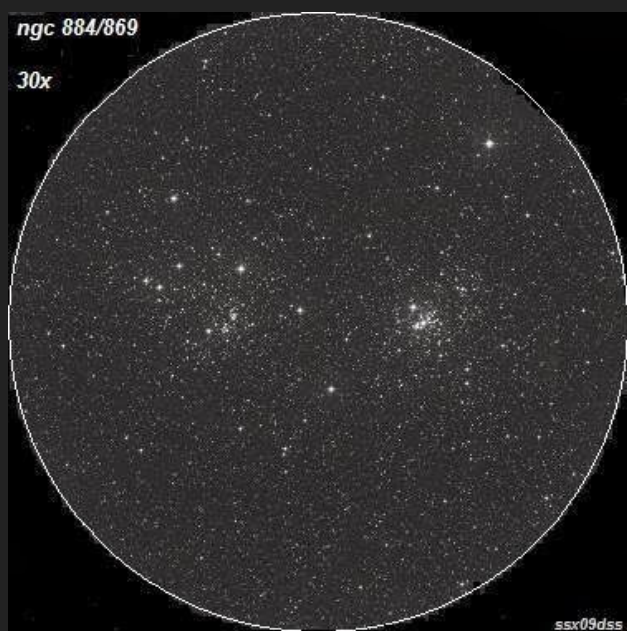
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ssx09dss

ngc 884/869

30x



ssx09dss

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#### also see

saber does the stars (vol. 1)

saber does the stars (vol. 2/c14 is awesome!

stephen saber's astro-vids at youtube

No comments:



saber, stargazing, caldwell astronomy, binoculars, caldwell catalog, deepsky, dso, messier marathon from memory, messier-caldwell marathon, moon, pleiades, stargazing

## A.L. Southern Sky Observe Program Mash-Up: Binocular, Telescopic, and Caldwell



*Stephen Saber*

Southern sky fix of DSOs appearing in the Binocular program [B], Telescopic program [T], and Caldwell Catalog [C] objects #59–109 (so they can be logged for that program as well). Targets are listed alphabetically by constellation and Right Ascension. 100 more bright doublestars down under can be found [here](#). Happy hunting.

[T] C107/NGC6101 Apus 16h 25.8 m -72° 12' 9.2 5 ' GC

[T] C63/NGC7293 Aquarius 22h 29.6 m -20° 48' 7.5 16 ' PN

[C]\* C82/NGC6193 Ara 1641–4846 mag 5.2 OC

[B] NGC 6208 Ara 1650–5349 mag 7.2 OC

[T] NGC 6250 Ara 16h 58.0 m -45° 56' 5.9 7 ' OC

[B] H 13 Ara 1702–4806 mag 9.0 OC

[B] IC 4651 Ara 1725–4957 mag 6.9 OC

[B/T] C81/NGC6352 Ara 17h 25.5 m -48° 25' 7.8 9 ' GC

[B/T] NGC 6362 Ara 17h 31.9 m -67° 03' 8.1 14 ' GC

[B/T] C86/NGC6397 Ara 17h 40.7 m -53° 40' 5.3 30 ' GC

[C] C64/NGC2362 Canis Major 0719–2457 mag 4.1 OC

[B/T] C96/NGC2516 Carina 07h 58.3 m -60° 51' 3.8 30 ' OC

[B/T] NGC 2808 Car 09h 12.0 m -64° 52' 6.2 13 ' GC

[C] C90/NGC2867 Car 0921–5819 mag 9.7 PN

[B/T] NGC 3114 Car 10h 02.7 m -60° 06' 4.2 35 ' OC

[T] NGC 3247 Car 10h 25.9 m -57° 56' 7.6 6 ' OC + Neb

[B/T] NGC 3293 Car 10h 35.8 m -58° 14' 4.7 40.0 ' OC + Neb

[T] NGC 3324 Car 10h 37.3 m -58° 38' 6.7 16.0 ' OC + Neb

[B] Mel 101 Car 1042–6506 mag 8.9 OC

[B/T] C92/NGC3372 Car 10h 43.8 m -59° 52' 120.0 ' OC + Neb Eta Carina

[B/T] C102/IC2602 Car 10h 43.9 m -64° 24' 1.6 50 ' OC Southern Pleiades

[T] Keyhole Car 10h 44.3 m -59° 39' Dk Nebula

[B/T] C91/NGC3532 Car 11h 05.6 m -58° 44' 3 55.0 ' OC

[B] IC 2714 Car 1118–6242 mag 8.2 OC

[B] Mel 105 Car 1120–6330 mag 8.5 OC

[T] NGC 3572 Car 11h 10.4 m -60° 15' 6.6 20.0 ' OC + Neb

[B/T] C97/NGC3766 Centaurus 11h 36.1 m -61° 37' 5.3 12.0 ' OC

[T] C100/IC2944 Cen 1137-6302 mag 4.5 OC

[T] NGC 3918 Cen 11h 50.3 m -57° 11' 8.4 0.3 ' PN Blue Planetary

[B] NGC 4852 Cen 1300-5936 mag 8.5 OC

[T] C83/NGC4945 Cen 13h 05.4 m -49° 28' 9.3 20x3.8 ' Galaxy

[B/T] C77/NGC5128 Cen 13h 25.5 m -43° 01' 7.8 25x20 ' Galaxy Centaurus A

[B/T] C80/NGC5139 Cen 13h 26.8 m -47° 29' 3.9 53 ' GC Omega Centauri

[B/T] C84/NGC5286 Cen 13h 46.4 m -51° 22' 7.4 11 ' GC

[T] NGC 5281 Cen 13h 46.6 m -62° 55' 5.9 5.0 ' OC

[B/T] NGC 5316 Cen 13h 54.0 m -61° 52' 6 13 ' OC

[B] NGC 5460 Cen 1408-4819 mag 5.6 OC

[B] NGC 5617 Cen 1430-6043 mag 6.3 OC

[B] NGC 5662 Cen 1435-5633 mag 5.5 OC

[T] AlphaCen Cen 14h 39.7 m -60° 50 0 Double star 0.0, 1.2 mag; sep 18.1"

[C] C62/NGC247 Cetus 0047-2046 mag 8.9 GX

[T] C109/NGC3195 Chameleon 10h 09.4 m -80° 52' 11.5 0.6 ' PN

[B/T] C88/NGC5823 Circinus 15h 05.5 m -55° 36' 7.9 10.0 ' OC

[B/T] C73/NGC1851 Columba 05h 14.1 m -40° 03' 701 11.0 ' GC

[B] C78/NGC6541 Corona Australis 1808-4342 mag 6.1 GC

[C] C68/NGC6729 CrA 1902-3657 mag 9.7 BN

[C] C60/61 NGC4038/9 Corvus 1202-1852 mag 11/13 GX

[T] NGC 4361 Corvus 12h 24.5 m -18 47' 10 1.7' PN

[B] NGC 4052 Crux 1202-6312 mag 8.5 OC

[B] NGC 4103 Cru 1207-6115 mag 7.4 OC

[B] NGC 4337 Cru 1224-5808 mag 8.6 OC

[B] H5 Cru 1225-6029 mag 8.5 OC

[B] NGC 4349 Cru 1225-6154 mag 7.4 OC

[T] Acrux Cru 12 h 26.6m -63° 06' Double Star 1.3, 1.7 4.2"; 4.9 90"

[B/T] C98/NGC4609 Cru 12h 42.3 m -62° 59' 6.5 5 ' OC

[B/T] C99/Coalsack Cru 12h 53 m -63° 400' Dk Nebula

[B/T] C94/NGC4755 Cru 12h 53.6 m -60° 22' 4.2 10 ' OC The Jewel Box

[T] NGC 1763 Dorado 04h 56.8 m -66° 24' 25.0 ' Br Neb In LMC

[T] NGC 1850 Dor 05h 08.7 m -68° 46' 9.3 3 ' OC In the LMC

[B] LMC 0524-6945 Dor mag 0.9 GX



[T] NGC 1955 Dor 05h 26.1 m -67° 28' 9 OC + Neb In the LMC

[T] NGC 1962 Dor 05h 26.5 m -68° 46' 8 OC + Neb In the LMC

[B/T] C103/NGC2070 Dor 05h 38.7 m -69° 06' 8.2 40 ' OC + Neb Tarantula

[T] NGC 1549 Dor 04h 15.7 m -55° 35' 10.7 4.9x4 ' Galaxy pair with ngc 1553

[T] NGC 1566 Dor 04h 20.0 m -54 56 10.3 8.3x 6.5 galaxy

[T] NGC 2074 Dor 05h 38.9 m -69° 28' OC + Neb In the LMC

[T] NGC 1291 Eridanus 03h 17.3 m -41° 07' 9.4 9.8x8.1 ' Galaxy

[T] C67/NGC1097 Fornax 02h 46.3 m -30° 16' 10.2 9.3 x 6.2' Galaxy

[T] NGC 1316 For 03h 22.6 m -37° 12' 9.4 11x7 ' Galaxy

[T] NGC 1360 For 03h 33.3 m -25° 52' 9.6 6.4 ' PN

[T] NGC 1365 For 03h 33.6 m -36° 08' 10.3 11.3x6.2 ' Galaxy

[T] NGC 1399 For 03h 38.5 m -35° 27' 9.9 3.2x3.1 ' Galaxy

[B/T] C87/NGC1261 Horologium 03h 12.3 m -55° 13' 8.3 7 ' GC

[T] C59/NGC3242 Hydra 10h 24.8 m -18° 38' 8.6 .4 PN Ghost of Jupiter

[T] NGC 3621 Hya 11h 18.3 m -32 48 9.8 13.3x6.1 Galaxy

[T] M83/NGC5236 Hya 13h 37.0 m -29° 52' 8.2 12.8x11.4 ' Galaxy

[C] C66/NGC5694 Hya1440–2632 mag 10.2 GC

[B] NGC 5822 Lupus 1505–5421 mag 6.5 OC

[T] NGC 5927 Lup 15h 28.0 m -50° 40' 8 5.7 ' GC

[T] NGC 5986 Lup 15h 46.1 m -37° 47' 7.6 9 ' GC

[T] C108/NGC4372 Musca 12h 25.8 m -72° 40' 7.2 5 ' GC

[B] NGC 4463 Mus 1230–6448 mag 7.2 OC

[B] H6 Mus 1235–6810 mag 9.5 OC

[B] NGC 4815 Mus 1258–6457 mag 8.6 OC

[B/T] C105/NGC4833 Mus 12h 59.6 m -70° 53' 8.4 13.5 ' GC

[T] NGC 5189 Mus 13h 33.5 m -65° 59' 9.5 3.1x1.2 ' PN

[B] NGC 5925 Norma 1528–5431 mag 8.4 OC

[T] NGC 5946 Nor 15h 35.5 m -50° 40' 8.4 3 ' GC

[B/T] NGC 6067 Nor 16h 13.2 m -54° 13' 5.6 12 ' OC

[B] H 10 Nor 1616–5452 mag 9.0 OC

[B/T] C89/NGC6087 Nor 16h 18.9 m -57° 54' 5.4 12 ' OC

[B] NGC 6134 Nor 1628–4909 mag 7.2 OC

[B] NGC 6152 Nor 1633–5237 mag 8.1 OC

[B] NGC 6167 Nor 1634–4936 mag 6.7 OC

[T] M62/NGC6266 Ophiuchus 17h 01.2 m -30° 07' 6.4 11 ' GC

[T] C101/NGC6744 Pavo 19h 09.8 m -63° 51' 9.1 20x12' Galaxy

[B/T] C93/NGC6752 Pavo 19h 10.9 m -59° 59' 5.3 28 ' GC

[T] NGC 2439 Puppis 07h 40.8 m -31° 41' 6.9 10 ' OC

[T] M93/NGC2447 Pup 07h 44.6 m -23 52' 6.2 22' OC

[B] NGC 2451 Pup 0746–3758 mag 2.8 OC

[B] C71/NGC2477 Pup 0752–3833 mag 5.8 OC

[T] NGC 2527 Pup 08h 04.9 m -28 09' 6.5 22' OC

[B] NGC 2546 Pup 0812–3738 mag 6.3 OC

[B] NGC 2627 Pyxis 0837–2957 mag 8.4 OC

[T] NGC 1313 Reticulum 03h 18.2 m -66° 30' 9.2 9.1x6.9 ' Galaxy

[T] M20/NGC6514 Sagittarius 18h 02.3 m -23° 01' 6 17x20 ' OC + Neb

[T] B 86 Sgr 18h 02.9 m -27° 52' 5' Dk Neb Near NGC 6520

[T] M8/NGC6523 Sgr 18h 03.8 m -24° 23' 6 50x40 ' Br Neb

[T] M17/NGC6618 Sgr 18h 20.8 m -16° 11' 6 46.0 ' OC + Neb

[T] M22/NGC 6656 Sgr 18h 36.4 m -23° 54' 5.2 33 ' GC

[T] NGC 6723 Sgr 18h 59.6 m -36° 38' 6.8 13 ' GC

[T] M55/NGC6809 Sgr 19h 40.0 m -30° 58' 6.3 19 ' GC

[T] M4/NGC6121 Scorpius 16h 23.6 m -26° 32' 5.4 30 ' GC

[B] C75/NGC6124 Sco 1626–4040 mag 5.8 OC

[B/T] C76/NGC6231 Sco 16h 54.2 m -41° 49' 2.6 14 ' OC + Neb

[T] NGC 6281 Sco 17h 04.8 m -37° 54' 5.4 8 ' OC + Neb

[C] C69/NGC6302 Sco 1714–3706 mag 12.5 PN

[T] NGC 6388 Sco 17h 36.3 m -44° 44' 6.8 6 ' GC

[T] M6/NGC6405 Sco 17h 40.3 m -32° 16' 4.2 14 ' OC

[T] M7/NGC6475 Sco 17h 53.9 m -34° 49' 3.3 80.0 ' OC

[T] NGC 7793 Sculptor 23h 57.8 m -32 35' 9.6 10.0x6.5 Galaxy

[T] C72/NGC55 Scl 00h 15.1 m -39° 12' 8.4 32x6 ' Galaxy

[T] C65/NGC253 Scl 00h 47.6 m -25° 17' 8 27x6 ' Galaxy

[T] NGC 0288 Scl 00h 52.8 m -26° 35' 8.1 13 ' GC

[C] C70/NGC300 Scl 0055–3741 mag 8.1 GX

[B] NGC 6584 Telescopium 1819–5213 mag 9.0 GC

[B/T] C95/NGC6025 Triangulum Australe 16h 03.3 m -60° 25' 5.1 12 ' OC

[B/T] C106/NGC104 Tucana 00h 24.1 m -72° 05' 4 50 ' GC 47 Tucanae

[B/T] SMC/NGC292 Tuc 00h 52.8 m -72° 50' 2.7 210x140' Galaxy

[T] NGC 330 Tuc 00h 56.3 m -72° 28' 9.6 2 ' OC In the SMC

[T] NGC 346 Tuc 00h 59.1 m -72° 11' 10.3 14 ' OC + Neb In the SMC

[B/T] C104/NGC362 Tuc 01h 03.2 m -70° 51' 6.8 13 ' GC

[T] BetaTuc Tuc 00h 31.5 m -62° 58 Double Star 4.4, 4.5 27"; 10' 5.1

[T] NGC 371 Tuc 01h 03.5 m -72° 05' 8' OC In the SMC

[T] NGC 419 Tuc 01h 08.3 m -72° 53' 10.6 2.6' GC In the SMC

[B/T] NGC 2547 Vela 08h 10.2 m -49° 14' 4.7 20 ' OC

[B] C85/IC2391 Vel 0840–5304 mag 2.5 OC

[B/T] IC 2395 Vel 08h 42.5 m -48° 07' 4.6 8' OC

[B] NGC 2659 Vel 0843–4457 mag 8.6 OC

[T] NGC 2669 Vel 08h 46.3 m -52° 52' 6.1 12 ' OC

[B] NGC 2670 Vel 0846–4847 mag 7.8 OC

[B] IC 2488 Vel 0928–5659 mag 7.4 OC

[B] NGC 2910 Vel 0930–5254 mag 7.2 OC

[B] NGC 2925 Vel 0934–5326 mag 8.3 OC

[T] C74/NGC3132 Vel 10h 07.0 m -40° 26' 8.2 1.3x0.8 ' PN

[B/T] C79/NGC3201 Vel 10h 17.6 m -46° 25' 6.9 21 ' GC

[B] NGC 3228 Vel 1022–5143 mag 6.0 OC

[T] M104/NGC4594 Virgo 12h 40.0 m -11° 37' 9 8.8x3.5 ' Galaxy

\*caldwell not appearing in either southern-only program.

c91 in carina courtesy of sdss

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A.L. Southern Sky Binocular Observe Program

A.L. Southern Sky Telescopic Observe Program

A.L. Caldwell Catalog Observe Program

Saber Does The Stars

C14 Is Awesome!

POV Astro Vids @ YouTube

No comments:



## Caldwell Catalog: The C Stands For Celebrity



C6: the cat's eye nebula (image credit: sdss)

*Stephen Saber*

Sir Patrick's deepsky object selections were based on targets that have scientifically special or unique properties (not just added as another pretty face or having a nickname) along with brightness. This [Hubble's Caldwell Catalog link](#) leads to the proper Gen-C/NASA primary identifiers, the old boomer NGC#, and each Caldwell's claim to fame.

Saber Does The Stars

C14 Is Awesome!

POV Astro Vids

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No comments:



**Asterisms: Contributions**



*Stephen Saber*

*SkyTimes interview (p.2)*

*st: you often seem have a very esoteric view of the sky.*

I'd call it 49% science, 51% beauty. My passion frequently comes out as humorous (to me, at least). Probably because my friend and mentor Rick Shaffer taught me, through his book, that stargazing could be interesting *and* fun. The night sky is still just a big playground to me.

*st: you must have hundreds of asterisms. I've seen a few.*

Showing amazing restraint I've only unleashed 6 on the astro-community. I'm not even going to make my own catalog (but if I did it would be Sbr 1-6). Most appear in the A.L. Asterism Observe Program.

Ally's Braid in Taurus

Little Joe (from Kokomo) in Pisces

The Jai-Alai or Ice Cream Scoop in Perseus

The Glum Cyclops in Aquarius

Dreamcatcher in Cygnus

The Sir Patrick Cluster in Cassiopeia (couldn't resist)

also see:

[Saber Does The Stars](#)

[C14 Is Awesome!](#)

[POV Astro Vids](#)

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