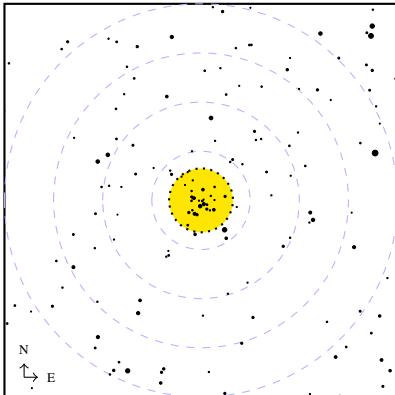
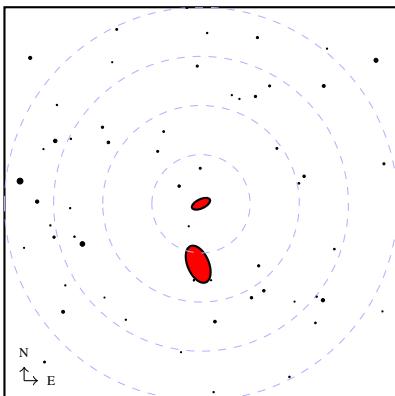


# Pocket Finder-Chart Atlas

M41 = U33 = NGC 2287



M82 = U42 = NGC 3034



Inverted-Image Version

*Alan Watson Forster*



# **Pocket Finder-Chart Atlas**

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Inverted-image version of 2022-03-26

# Contents

<b>Preface</b>	<b>v</b>
<b>1 The Messier Objects</b>	<b>1</b>
<b>2 The Caldwell Objects</b>	<b>25</b>
<b>3 The Urban Observing Program Objects</b>	<b>49</b>
<b>Bibliography</b>	<b>67</b>



# Preface

This is an atlas of finder charts for the Messier, Caldwell, and Astronomical League Urban Observing Program deep-sky objects.

The charts have a field of 4 degrees at a scale of 13 mm per degree. Circles show fields with diameters of 1, 2, 3, and 4 degrees. The charts show stars to magnitude 9.5, and represent deep-sky objects following the current convention. The correspondence between the magnitude of a star and its size on the charts is designed to better match the view in a telescope eyepiece.

There are versions of the atlas with inverted-image and correct-image charts. This version has inverted-image charts, with north up and east to the right, corresponding to the view through a Newtonian telescope or a refractor or Cassegrain telescope with a conventional diagonal.

The size and binding of this atlas are designed for convenience at the telescope.

One flaw of these charts is that all deep-sky objects are drawn as either ellipses (galaxies and star clouds) or circles (everything else). This means, for example, that they do not correctly show the shapes of irregular nebulae such as M42 and M43.

## Chart Legend

Stars			
• 1 mag		Open Cluster	0°
• 2 mag		Globular Cluster	1°
• 3 mag		Star Cloud or Asterism	2°
• 4 mag		Bright Nebula	3°
• 5 mag		Planetary Nebula	4°
• 6 mag		Dark Nebula	
• 7 mag		Galaxy	
• 8 mag			
• 9 mag			

I created this atlas to assist me as I observed under the light-polluted skies of Mexico City with a 70 mm f/6 refractor. I don't use a conventional finder with this telescope, but instead star-hop using a 32 mm eyepiece with a true field of about 4 degrees. Under my usual observing conditions, very few objects are immediately obvious, and the charts tell me when I've successfully reached the desired field and where to focus my efforts.

Of course, the obvious question is, but why not just use an all-sky atlas? I do indeed use the *Pocket Sky Atlas* for star-hopping, but I find that for confirming a field none of my all-sky atlases combine adequate depth with convenience at the telescope, and none really give me the sense of what I see through the eyepiece.

To some degree, the relation between these charts and the *Pocket Sky Atlas* is similar to the relation between the larger-scale and smaller-scale charts in *The Observer's Sky Atlas*. The smaller-scale charts are for star-hopping to the field and the larger-scale charts are to confirm the field and locate the object. I don't use *The Observer's Sky Atlas* at the telescope, because the smaller-scale charts are too shallow and too narrow for my needs, the large-scale charts aren't inverted, and the binding is inconvenient.

The positions and magnitudes of stars are taken from the Tycho-2 catalog, supplemented by the Hipparcos catalog for the very brightest stars. The positions, types, and sizes of deep sky objects are taken from the CDS SIMBAD database, supplemented by information from O'Meara's *Deep-Sky Companions* volumes, and the Astronomical League's Urban Observing Program list.

# **Chapter 1**

## **The Messier Objects**

The Messier objects are probably the most famous deep-sky objects. I find O'Meara's *Deep-Sky Companion: The Messier Objects* to be excellent on the origin of the catalog, the appearance of the objects, and their nature.

The following table lists the objects with their J2000 positions (decimal hours of right ascension and degrees of declination), the charts on which they appear in the *Pocket Sky Atlas*, their types, and other names. I follow O'Meara in identifying M102 as NGC 5866.

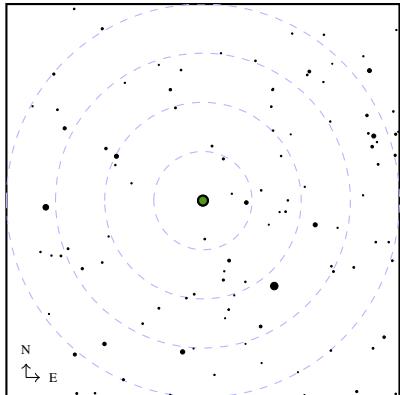
For completeness, I include finder charts for all of the Messier objects, even bright ones like M45.

Name	Position	PSA	Type	Other Names
M1	05.6 +22	14	BN	NGC 1952 = Crab Nebula
M2	21.6 -01	75/77	GC	U81 = NGC 7089
M3	13.7 +28	43/44	GC	U51 = NGC 5272
M4	16.4 -27	56/58	GC	U53 = NGC 6121
M5	15.3 +02	55/57	GC	U52 = NGC 5904
M6	17.7 -32	58/69	OC	U60 = NGC 6405 = Butterfly Nebula
M7	17.9 -35	58/69	OC	U62 = NGC 6475
M8	18.1 -24	67	BN	U64 = NGC 6523/6530 = Lagoon Nebula
M9	17.3 -19	56	GC	NGC 6333
M10	17.0 -04	54/56	GC	U57 = NGC 6254
M11	18.9 -06	65/67	OC	U69 = NGC 6705 = Wild Duck Cluster
M12	16.8 -02	54/56	GC	U56 = NGC 6218
M13	16.7 +36	52	GC	U54 = NGC 6205 = Hercules Cluster
M14	17.6 -03	54	GC	NGC 6402
M15	21.5 +12	75	GC	U80 = NGC 7078
M16	18.3 -14	67	BN	NGC 6611 = Eagle Nebula
M17	18.3 -16	67	BN	U65 = NGC 6618 = Omega Nebula
M18	18.3 -17	67	OC	NGC 6613
M19	17.0 -26	56	GC	NGC 6273
M20	18.0 -23	67	BN	NGC 6514 = Trifid Nebula
M21	18.1 -23	67	OC	NGC 6531
M22	18.6 -24	67	GC	U67 = NGC 6656
M23	17.9 -19	67	OC	NGC 6494
M24	18.3 -19	67	SC	IC 4715
M25	18.5 -19	67	OC	IC 4725
M26	18.8 -09	67	OC	NGC 6694
M27	20.0 +23	64	PN	U75 = NGC 6853 = Dumbell Nebula
M28	18.4 -25	67/I	GC	NGC 6626
M29	20.4 +38	62	OC	NGC 6913
M30	21.7 -23	77	GC	NGC 7099
M31	00.7 +41	3	Gal	U3 = NGC 224 = Andromeda Galaxy
M32	00.7 +41	3	Gal	U2 = NGC 221
M33	01.6 +31	3	Gal	NGC 598
M34	02.7 +43	2	OC	NGC 1039
M35	06.2 +24	14	OC	U27 = NGC 2168
M36	05.6 +34	12	OC	U23 = NGC 1960
M37	05.9 +33	12	OC	U26 = NGC 2099
M38	05.5 +36	12	OC	U22 = NGC 1912
M39	21.5 +48	73	OC	U82 = NGC 7092
M40	12.4 +58	32	DS	

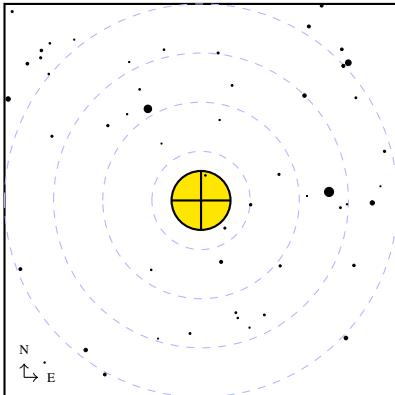
Name	Position	PSA	Type	Other Names
M41	06.8 -21	27	OC	U33 = NGC 2287
M42	05.6 -05	16/B	BN	U24 = NGC 1976 = Orion Nebula
M43	05.6 -05	16/B	BN	NGC 1982
M44	08.7 +20	24	OC	U39 = NGC 2632 = Beehive Cluster
M45	03.8 +24	15/A	OC	U17 = Mel 22 = Pleiades
M46	07.7 -15	26	OC	NGC 2437
M47	07.6 -14	27	OC	NGC 2422
M48	08.2 -06	26	OC	U38 = NGC 2548
M49	12.5 +08	45/C	Gal	NGC 4472
M50	07.0 -08	27	OC	U35 = NGC 2323
M51	13.5 +47	43	Gal	NGC 5194 = Whirlpool Galaxy
M52	23.4 +62	72	OC	NGC 7654
M53	13.2 +18	45	GC	NGC 5024
M54	18.9 -30	69	GC	NGC 6715
M55	19.7 -31	68	GC	NGC 6809
M56	19.3 +30	63	GC	NGC 6779
M57	18.9 +33	63	PN	U71 = NGC 6720 = Ring Nebula
M58	12.6 +12	45/C	Gal	NGC 4579
M59	12.7 +12	45/C	Gal	NGC 4621
M60	12.7 +12	45/C	Gal	NGC 4649
M61	12.4 +04	45	Gal	NGC 4303
M62	17.0 -30	58	GC	U58 = NGC 6266
M63	13.3 +42	43	Gal	NGC 5055 = Sunflower Galaxy
M64	12.9 +22	45	Gal	U50 = NGC 4826 = Black-Eye Galaxy
M65	11.3 +13	34	Gal	NGC 3623
M66	11.3 +13	34	Gal	NGC 3627
M67	08.9 +12	24	OC	U40 = NGC 2682
M68	12.7 -27	47	GC	NGC 4590
M69	18.5 -32	67	GC	NGC 6637
M70	18.7 -32	67	GC	NGC 6681
M71	19.9 +19	64	GC	NGC 6838
M72	20.9 -13	66/77	GC	NGC 6981
M73	21.0 -13	66/77	AST	NGC 6994
M74	01.6 +16	4/5	Gal	NGC 628
M75	20.1 -22	66	GC	NGC 6864
M76	01.7 +52	2	PN	NGC 651/650 = Little Dumbell
M77	02.7 -00	4	Gal	U12 = NGC 1068
M78	05.8 +00	16	BN	NGC 2068
M79	05.4 -25	16	GC	NGC 1904
M80	16.3 -23	56	GC	NGC 6093

Name	Position	PSA	Type	Other Names
M81	09.9 +69	31	Gal	U41 = NGC 3031
M82	09.9 +70	31	Gal	U42 = NGC 3034
M83	13.6 –30	47/48	Gal	NGC 5236
M84	12.4 +13	45/C	Gal	U45 = NGC 4374
M85	12.4 +18	45/C	Gal	NGC 4382
M86	12.4 +13	45/C	Gal	U46 = NGC 4406
M87	12.5 +12	45/C	Gal	U47 = NGC 4486
M88	12.5 +14	45/C	Gal	NGC 4501
M89	12.6 +13	45/C	Gal	NGC 4552
M90	12.6 +13	45/C	Gal	NGC 4569
M91	12.6 +14	45/C	Gal	NGC 4548
M92	17.3 +43	52	GC	U59 = NGC 6341
M93	07.7 –24	26	OC	NGC 2447
M94	12.8 +41	43	Gal	U49 = NGC 4736
M95	10.7 +12	34	Gal	NGC 3351
M96	10.8 +12	34	Gal	NGC 3368
M97	11.2 +55	32	PN	NGC 3587
M98	12.2 +15	45/C	Gal	NGC 4192
M99	12.3 +14	45/C	Gal	NGC 4254
M100	12.4 +16	45/C	Gal	NGC 4321
M101	14.1 +54	42	Gal	NGC 5457
M102	15.1 +56	42	Gal	NGC 5866
M103	01.6 +61	3	OC	NGC 581
M104	12.7 –12	47	Gal	U48 = NGC 4594 = Sombrero Galaxy
M105	10.8 +13	34	Gal	NGC 3379
M106	12.3 +47	34	Gal	NGC 4258
M107	16.5 –13	56	GC	NGC 6171
M108	11.2 +56	32/33	Gal	NGC 3556
M109	12.0 +53	32	Gal	NGC 3992
M110	00.7 +42	3	Gal	NGC 205

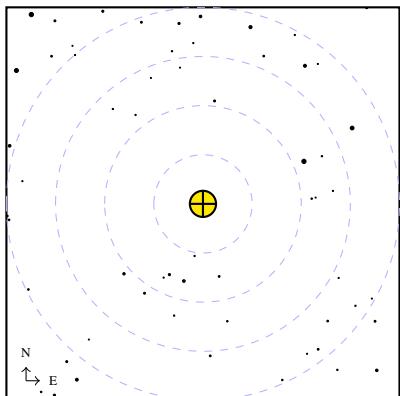
M1 = NGC 1952 = Crab Nebula



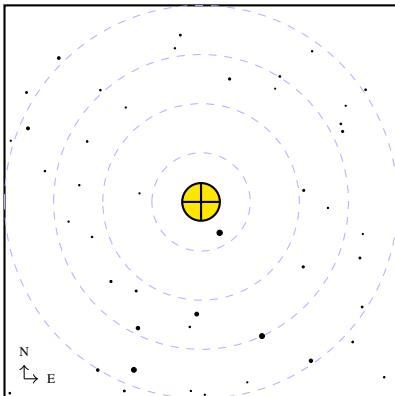
M4 = U53 = NGC 6121



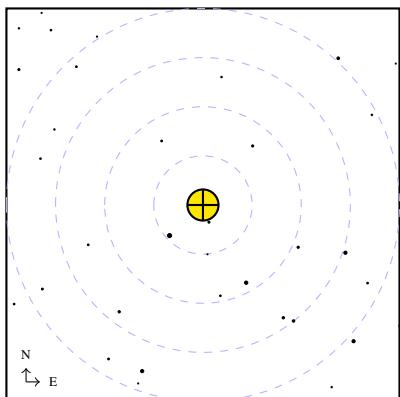
M2 = U81 = NGC 7089



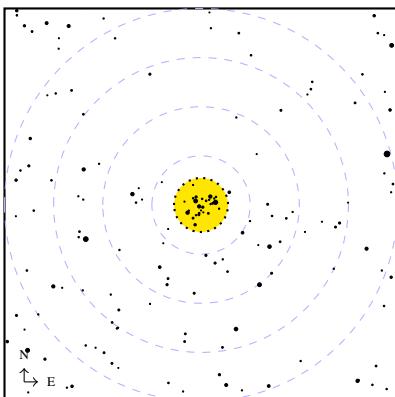
M5 = U52 = NGC 5904



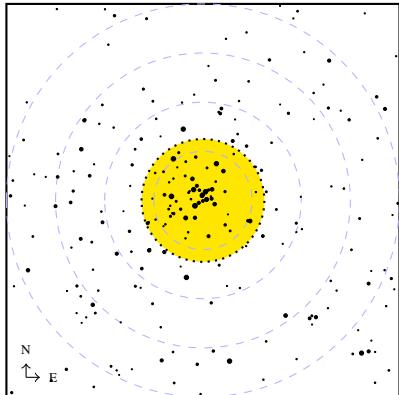
M3 = U51 = NGC 5272



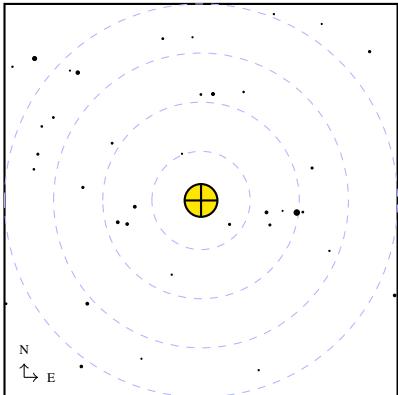
M6 = U60 = NGC 6405 = Butterfly Nebula



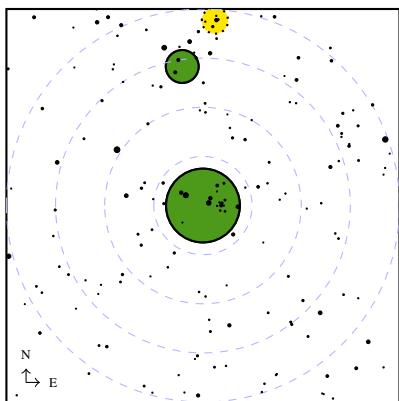
M7 = U62 = NGC 6475



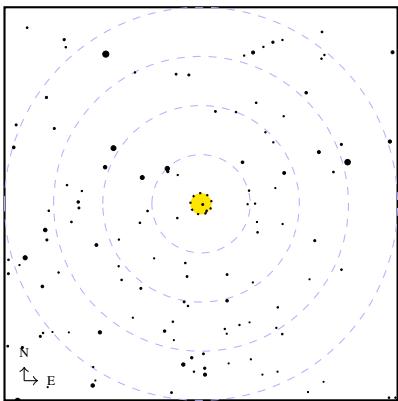
M10 = U57 = NGC 6254



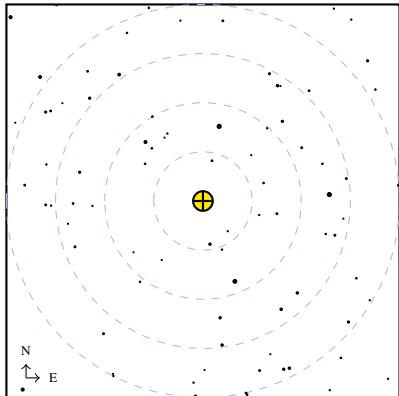
M8 = U64 = NGC 6523/6530 = Lagoon Nebula



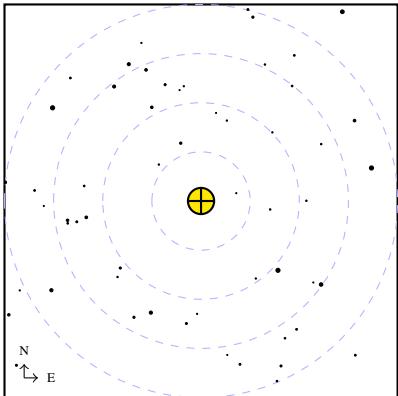
M11 = U69 = NGC 6705 = Wild Duck Cluster



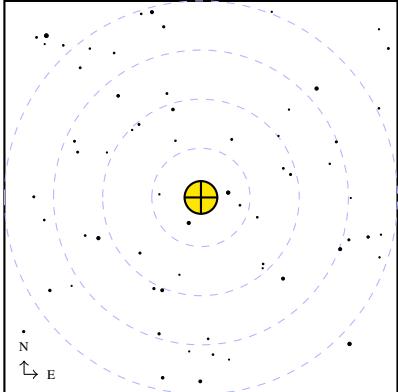
M9 = NGC 6333



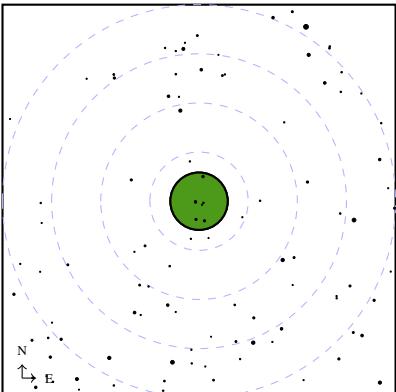
M12 = U56 = NGC 6218



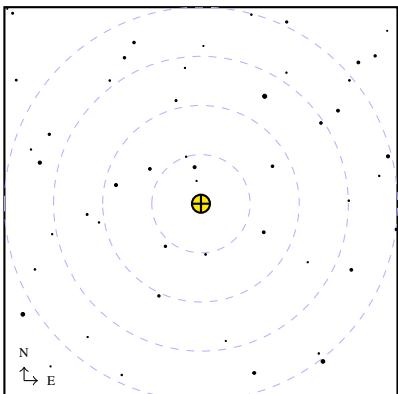
M13 = U54 = NGC 6205 = Hercules Cluster



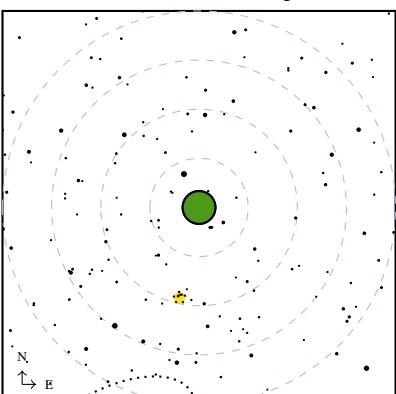
M16 = NGC 6611 = Eagle Nebula



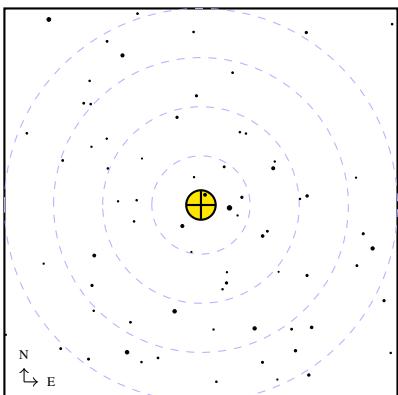
M14 = NGC 6402



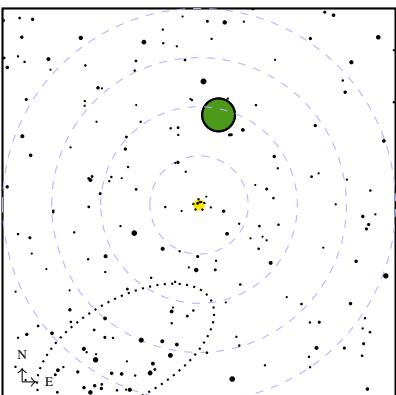
M17 = U65 = NGC 6618 = Omega Nebula



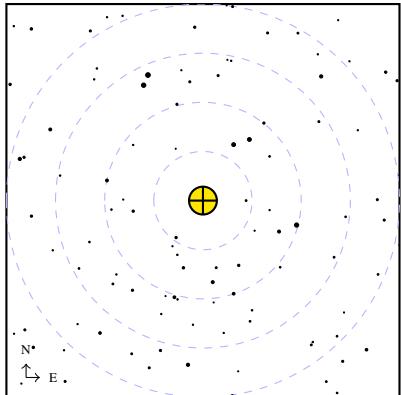
M15 = U80 = NGC 7078



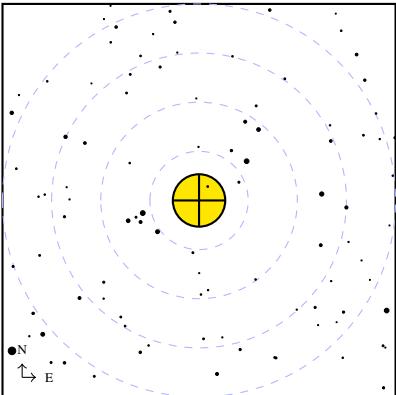
M18 = NGC 6613



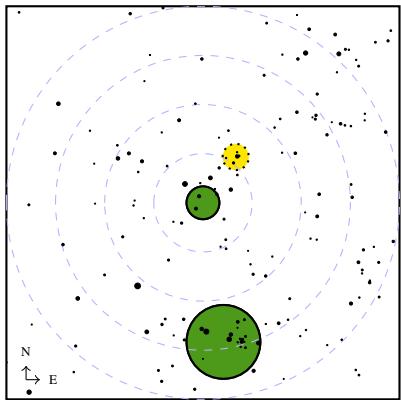
M19 = NGC 6273



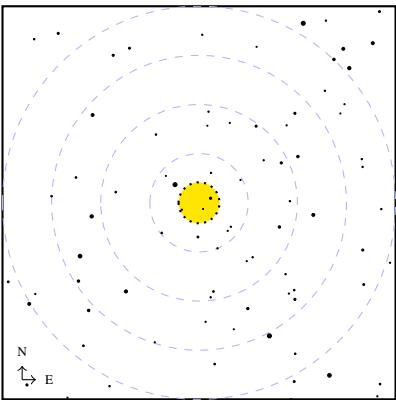
M22 = U67 = NGC 6656



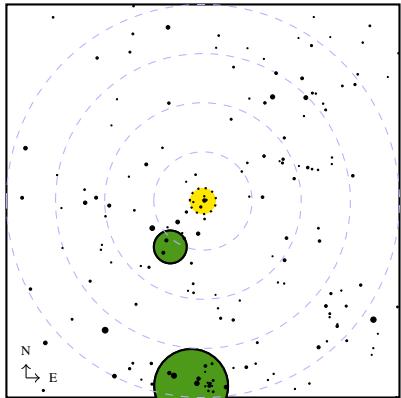
M20 = NGC 6514 = Trifid Nebula



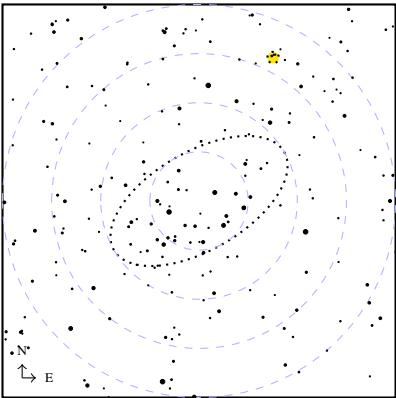
M23 = NGC 6494



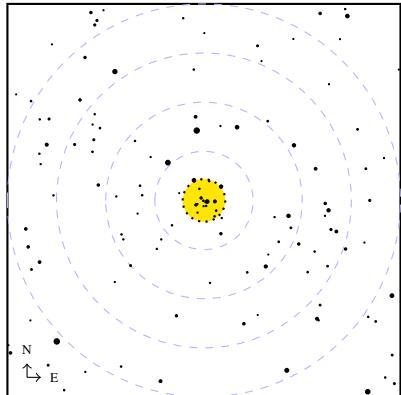
M21 = NGC 6531



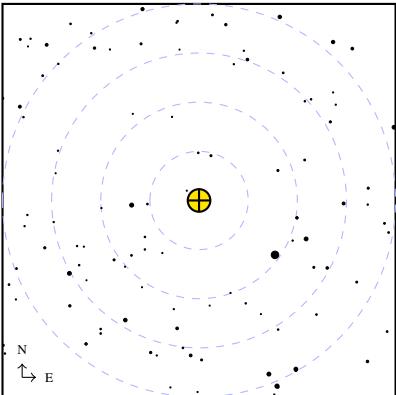
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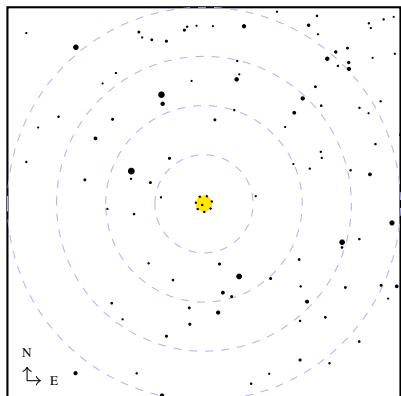
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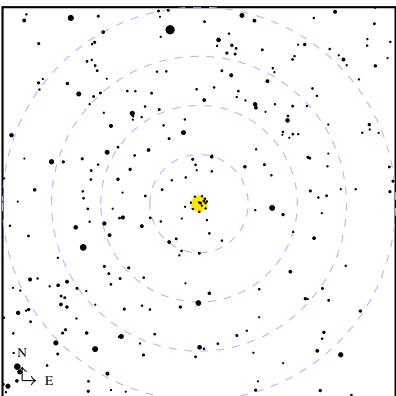
M28 = NGC 6626



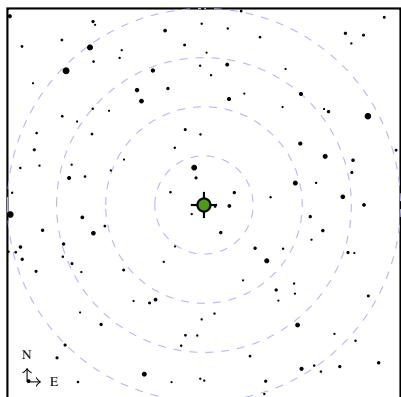
M26 = NGC 6694



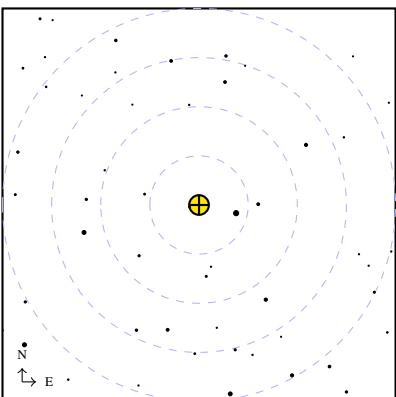
M29 = NGC 6913



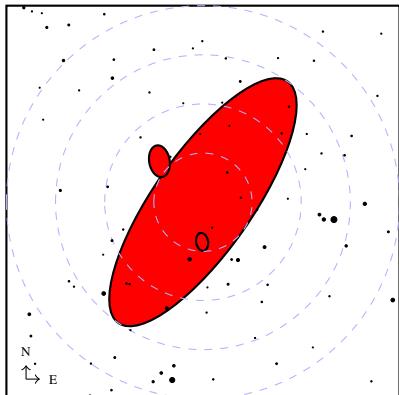
M27 = U75 = NGC 6853 = Dumbbell Nebula



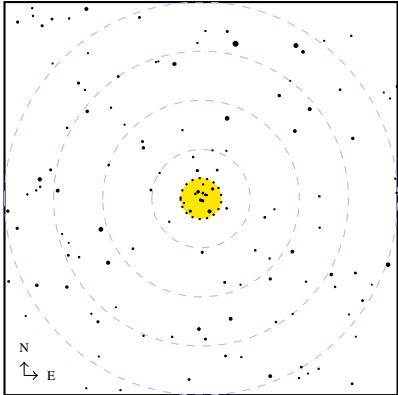
M30 = NGC 7099



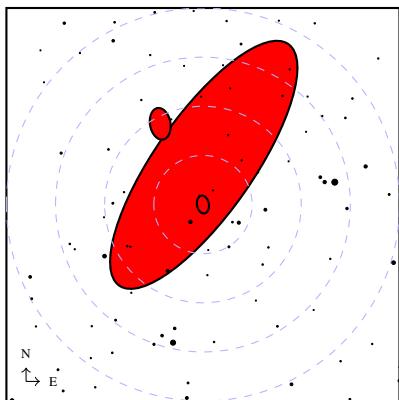
M31 = U3 = NGC 224 = Andromeda Galaxy



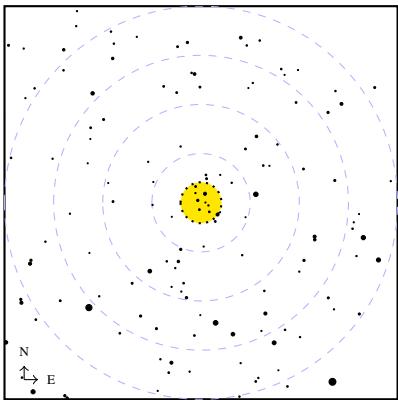
M34 = NGC 1039



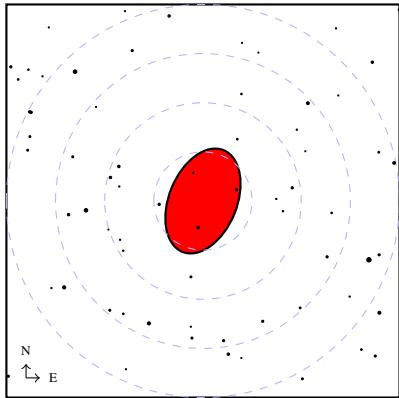
M32 = U2 = NGC 221



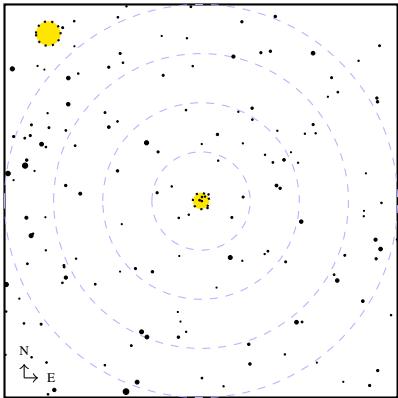
M35 = U27 = NGC 2168



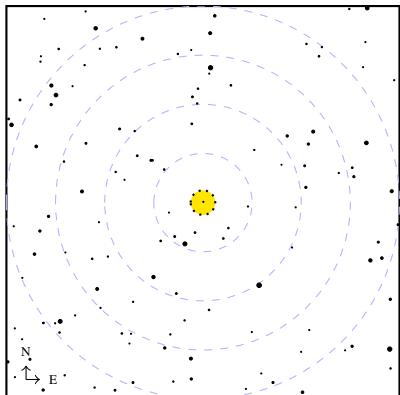
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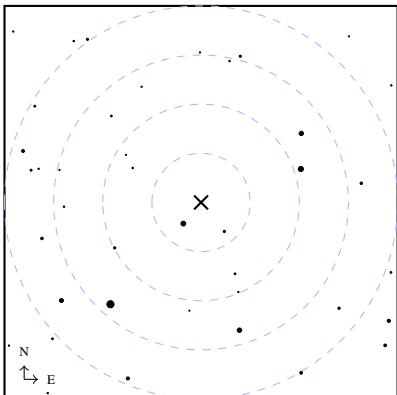
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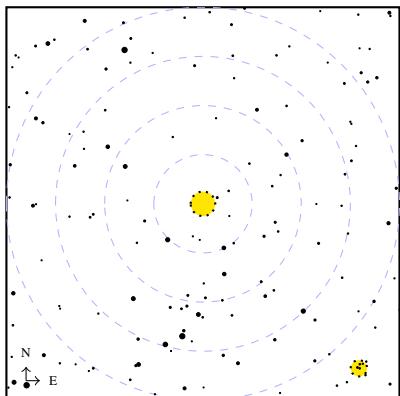
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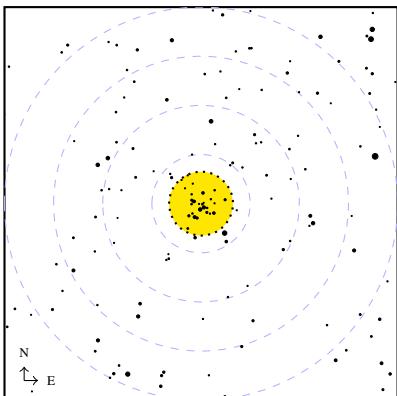
M40



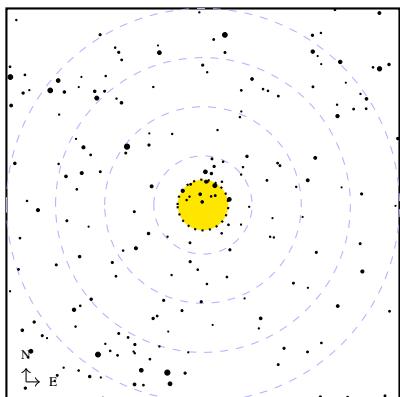
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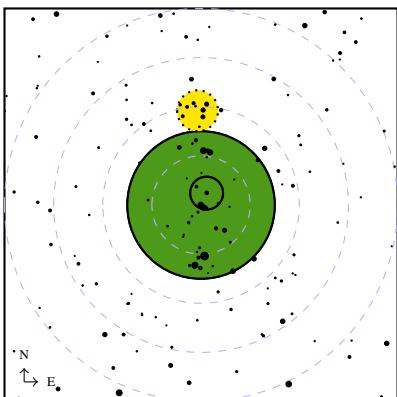
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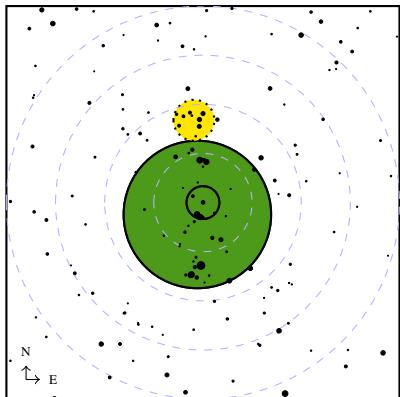
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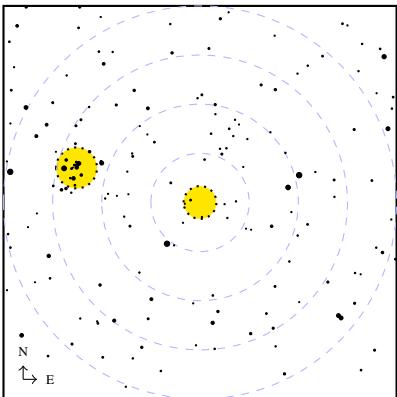
M42 = U24 = NGC 1976 = Orion Nebula



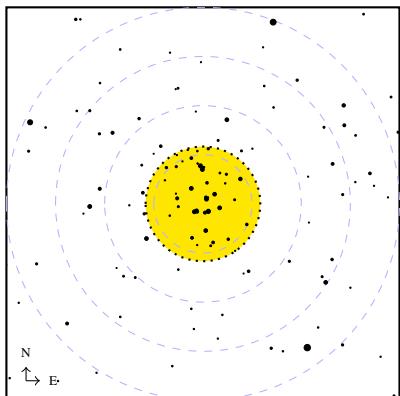
M43 = NGC 1982



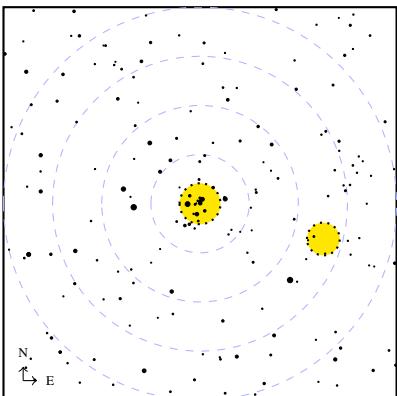
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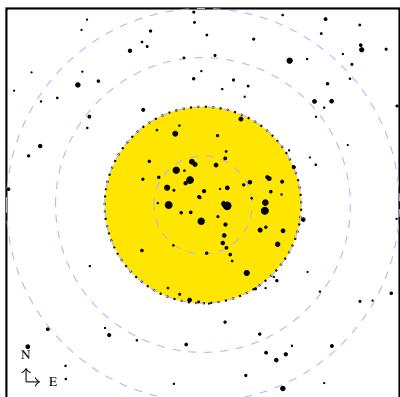
M44 = U39 = NGC 2632 = Beehive Cluster



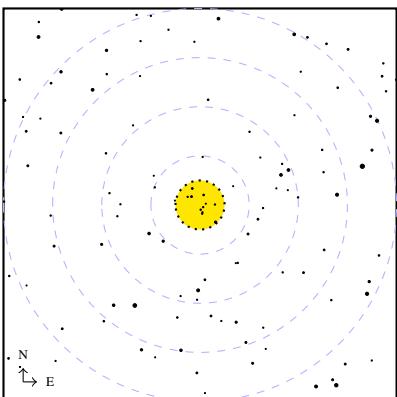
M47 = NGC 2422



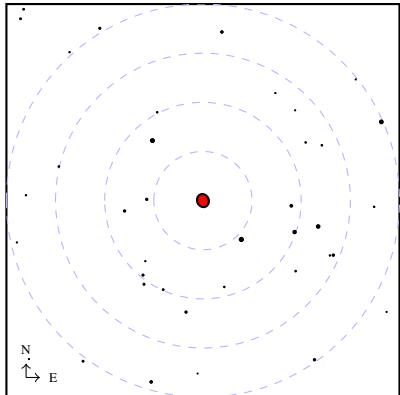
M45 = U17 = Mel 22 = Pleiades



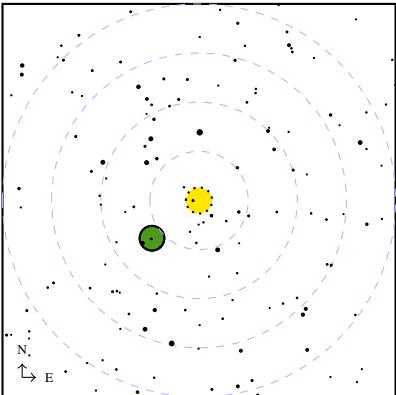
M48 = U38 = NGC 2548



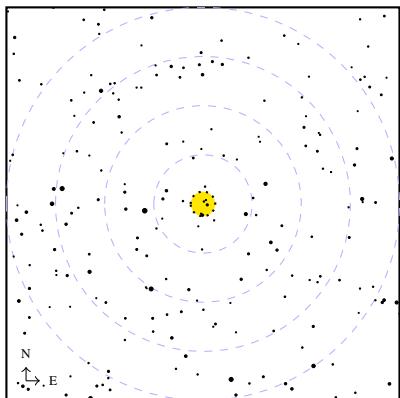
M49 = NGC 4472



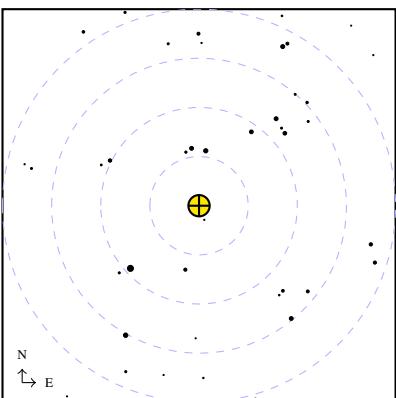
M52 = NGC 7654



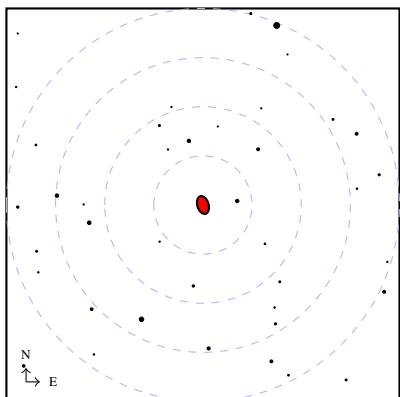
M50 = U35 = NGC 2323



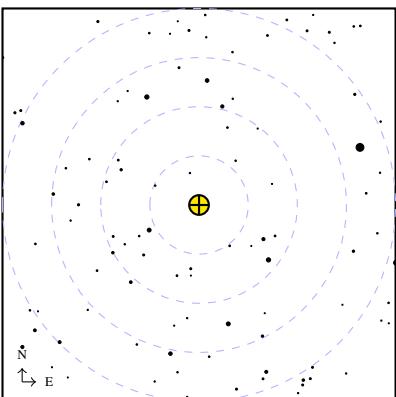
M53 = NGC 5024



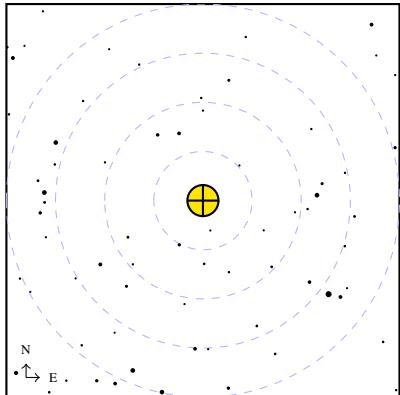
M51 = NGC 5194 = Whirlpool Galaxy



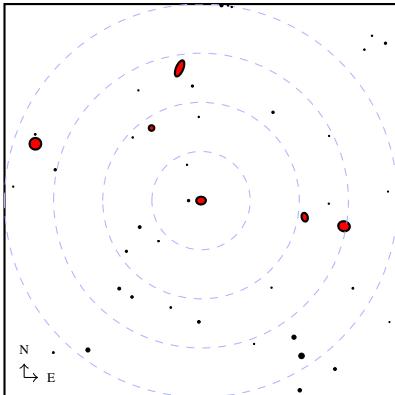
M54 = NGC 6715



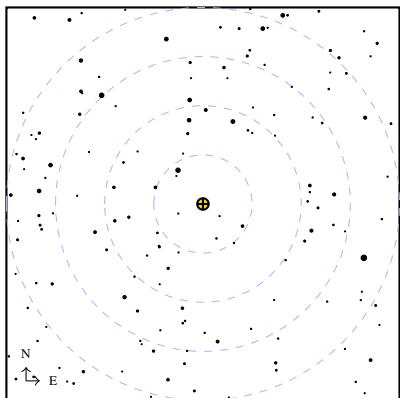
M55 = NGC 6809



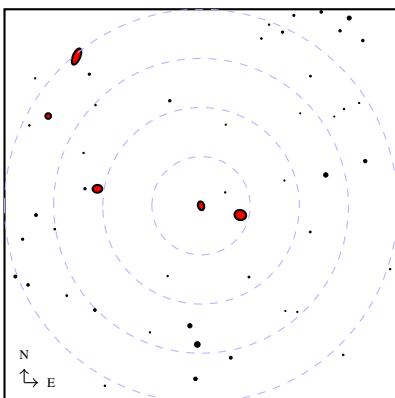
M58 = NGC 4579



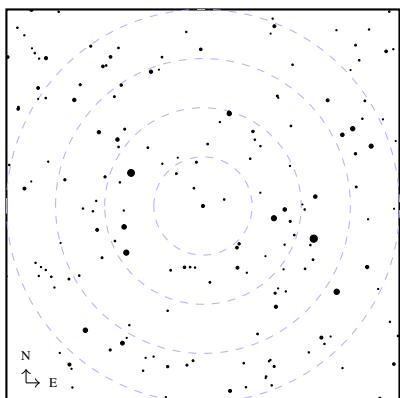
M56 = NGC 6779



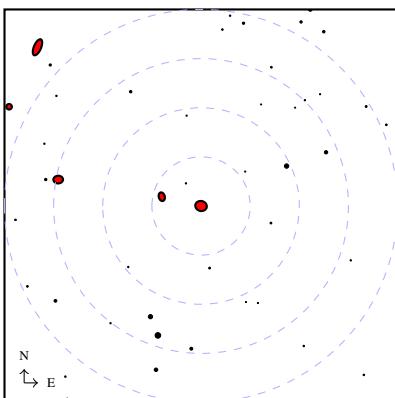
M59 = NGC 4621



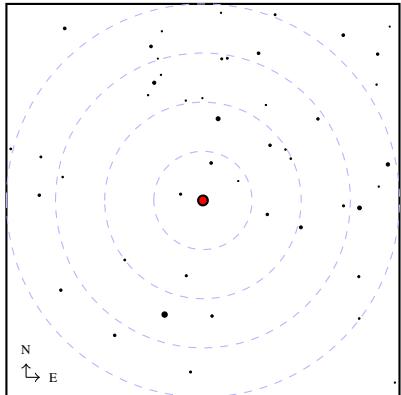
M57 = U71 = NGC 6720 = Ring Nebula



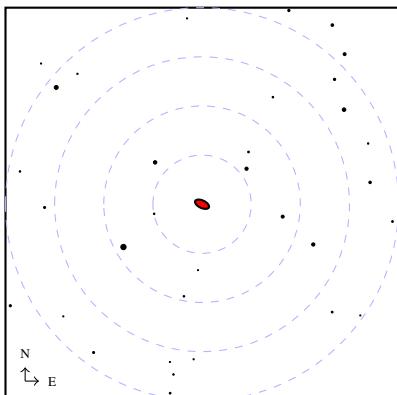
M60 = NGC 4649



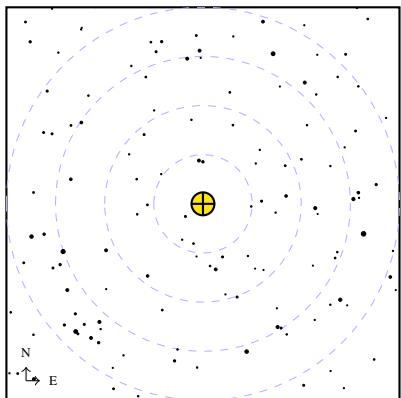
M61 = NGC 4303



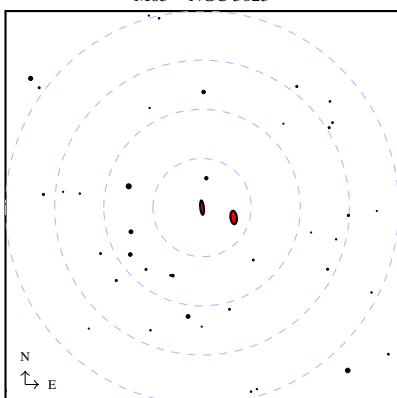
M64 = U50 = NGC 4826 = Black-Eye Galaxy



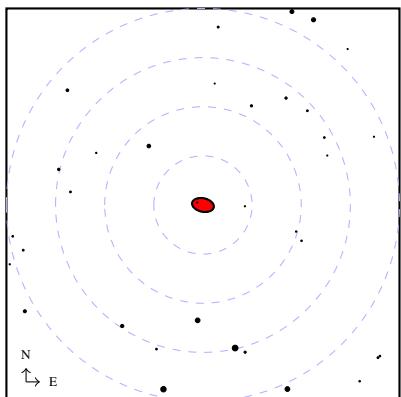
M62 = U58 = NGC 6266



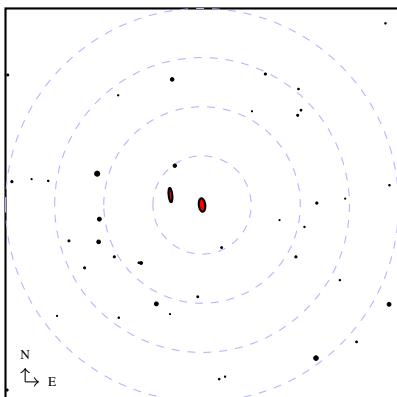
M65 = NGC 3623



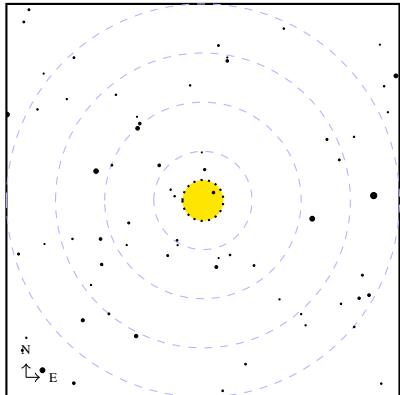
M63 = NGC 5055 = Sunflower Galaxy



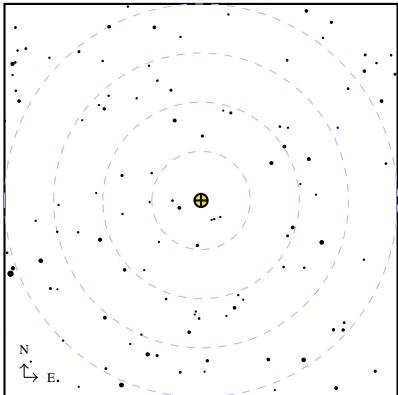
M66 = NGC 3627



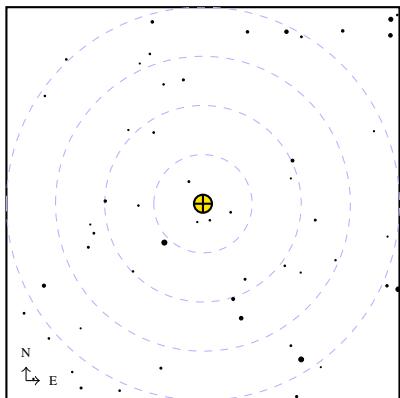
M67 = U40 = NGC 2682



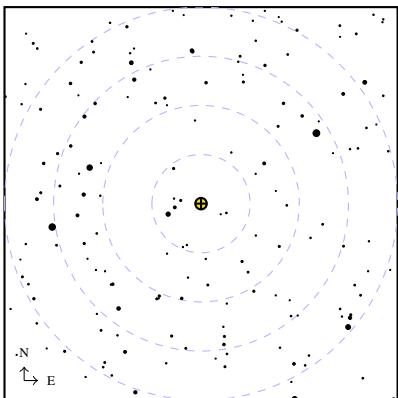
M70 = NGC 6681



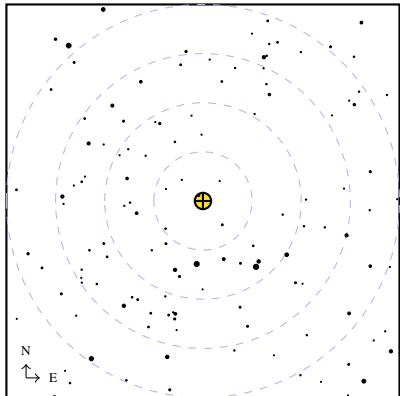
M68 = NGC 4590



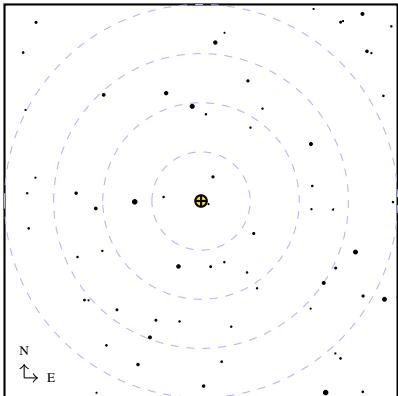
M71 = NGC 6838



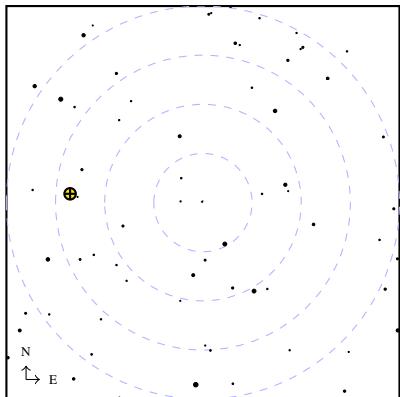
M69 = NGC 6637



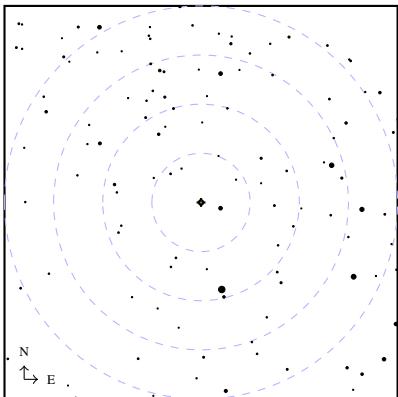
M72 = NGC 6981



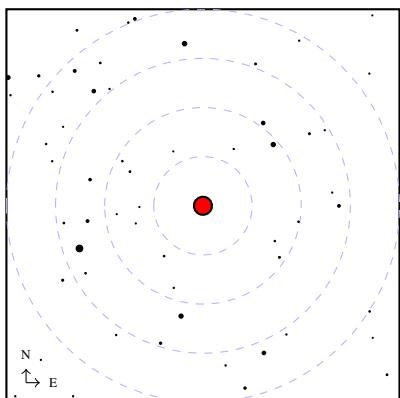
M73 = NGC 6994



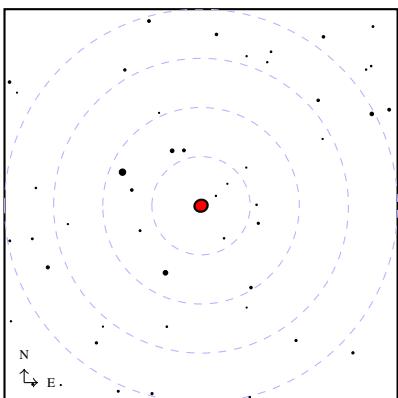
M76 = NGC 651/650 = Little Dumbbell



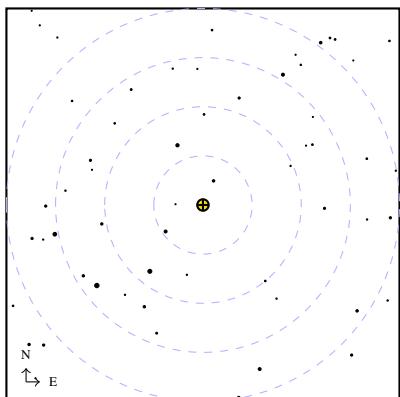
M74 = NGC 628



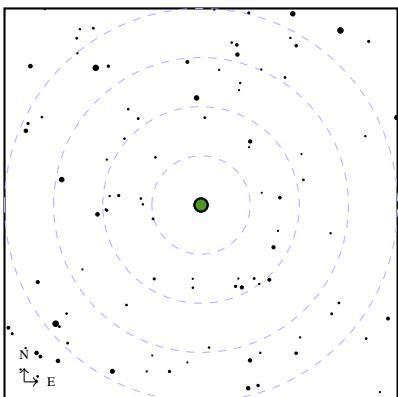
M77 = U12 = NGC 1068



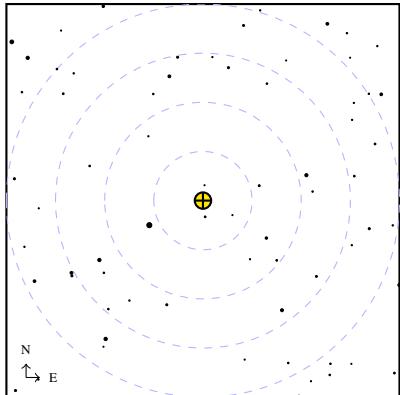
M75 = NGC 6864



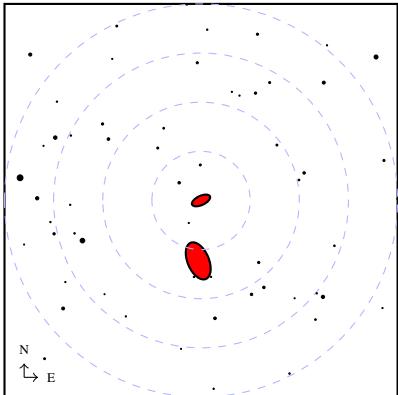
M78 = NGC 2068



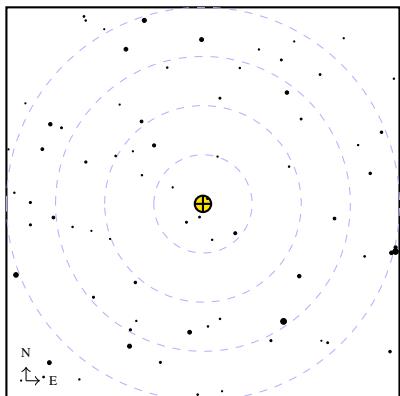
M79 = NGC 1904



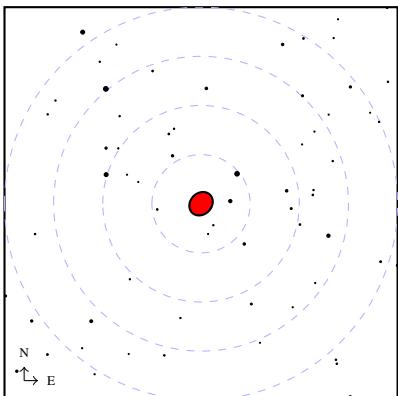
M82 = U42 = NGC 3034



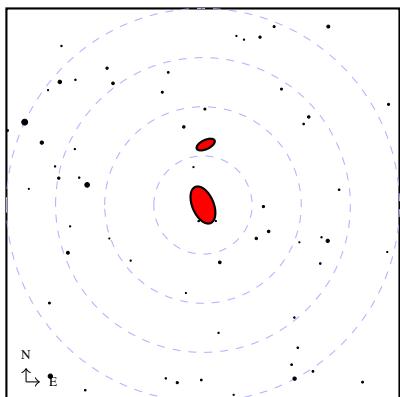
M80 = NGC 6093



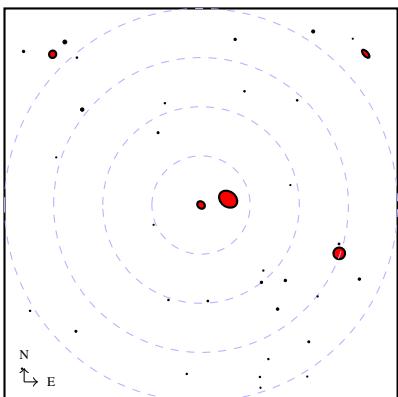
M83 = NGC 5236



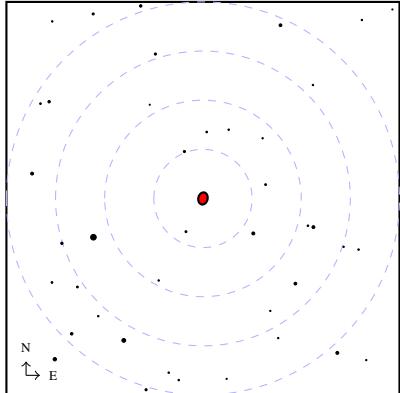
M81 = U41 = NGC 3031



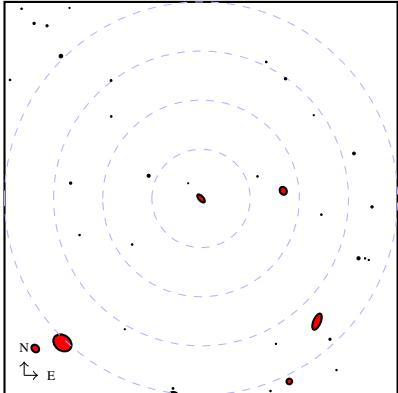
M84 = U45 = NGC 4374



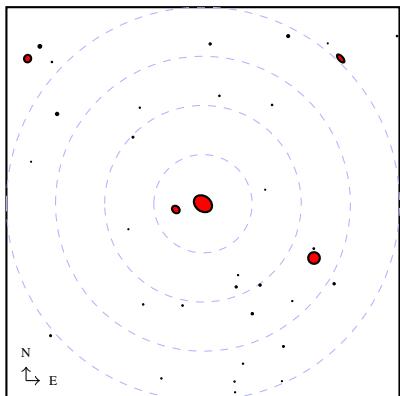
M85 = NGC 4382



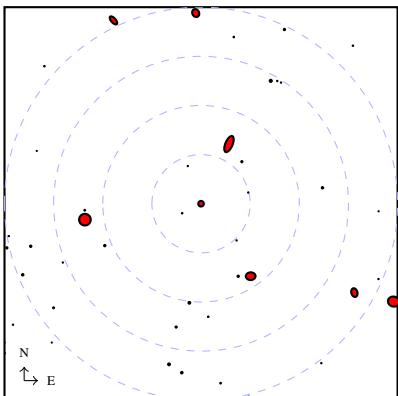
M88 = NGC 4501



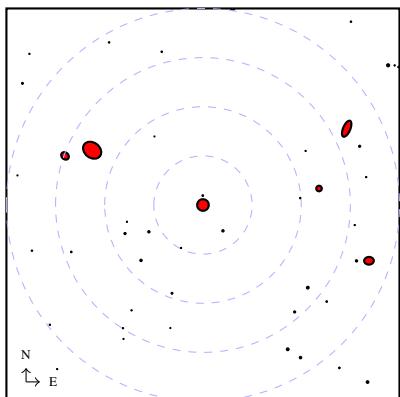
M86 = U46 = NGC 4406



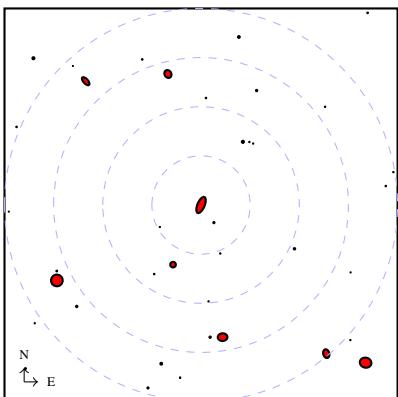
M89 = NGC 4552



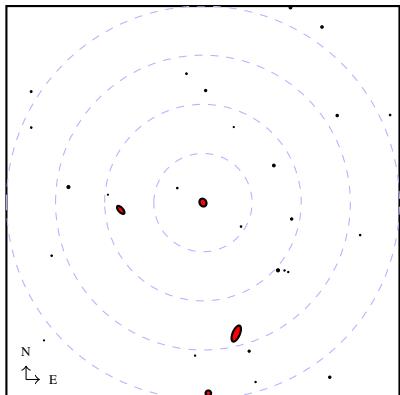
M87 = U47 = NGC 4486



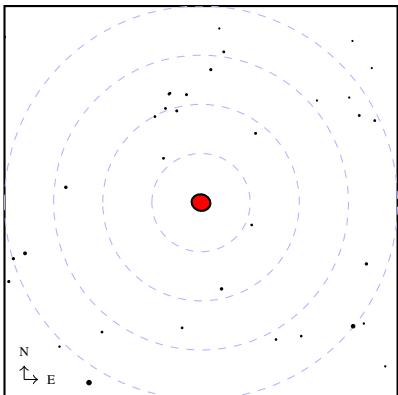
M90 = NGC 4569



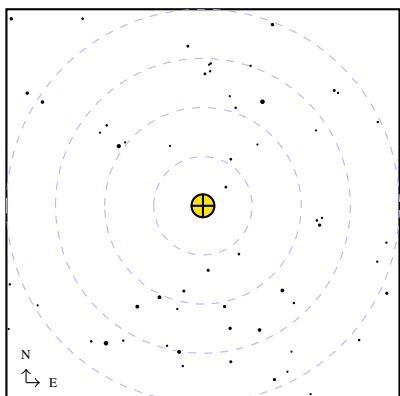
M91 = NGC 4548



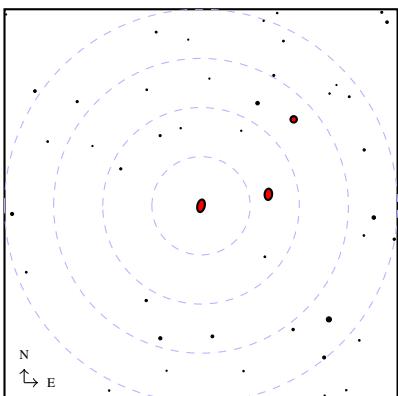
M94 = U49 = NGC 4736



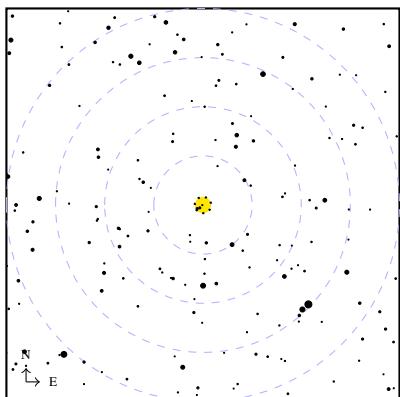
M92 = U59 = NGC 6341



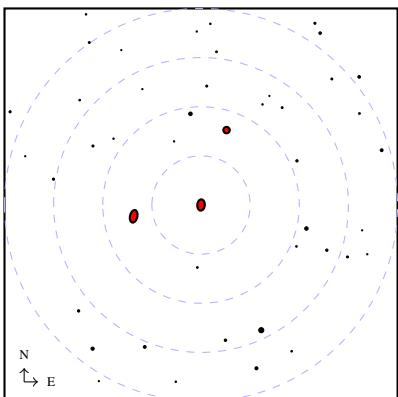
M95 = NGC 3351



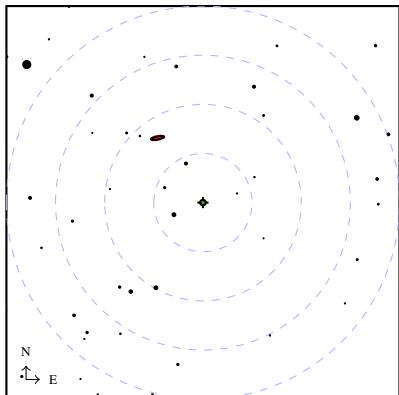
M93 = NGC 2447



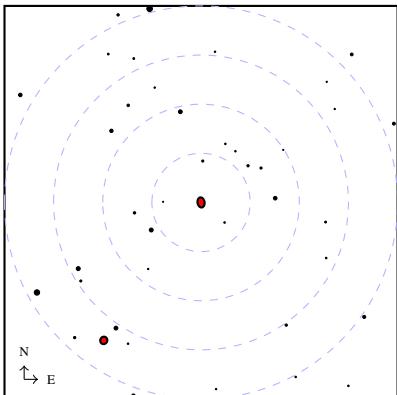
M96 = NGC 3368



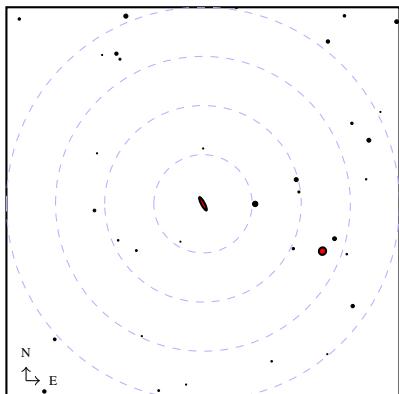
M97 = NGC 3587



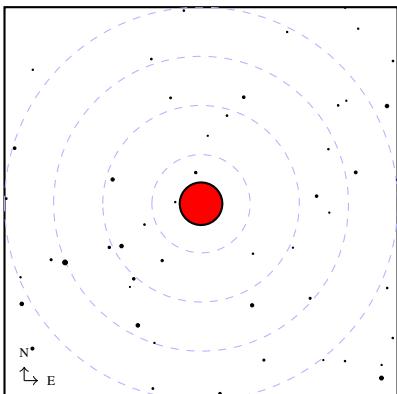
M100 = NGC 4321



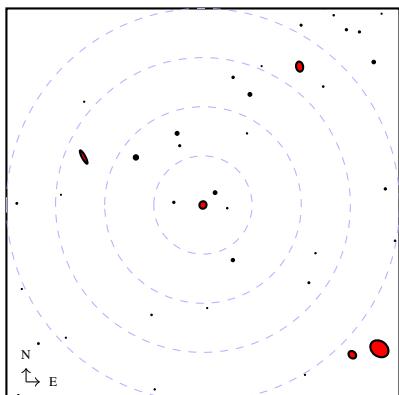
M98 = NGC 4192



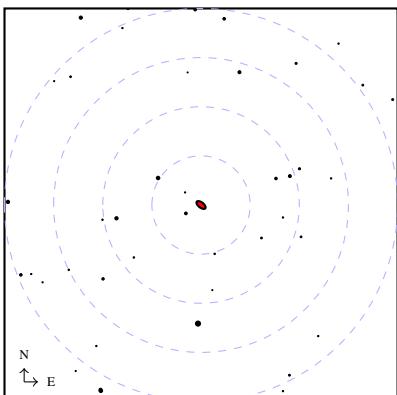
M101 = NGC 5457



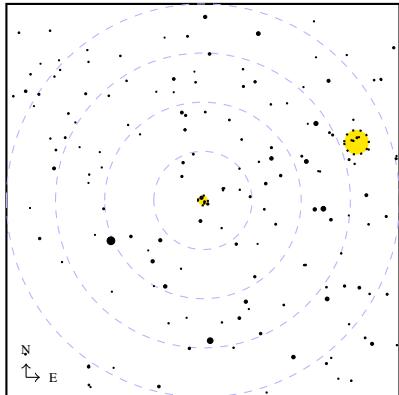
M99 = NGC 4254



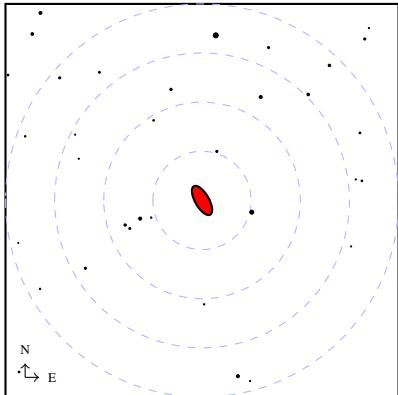
M102 = NGC 5866



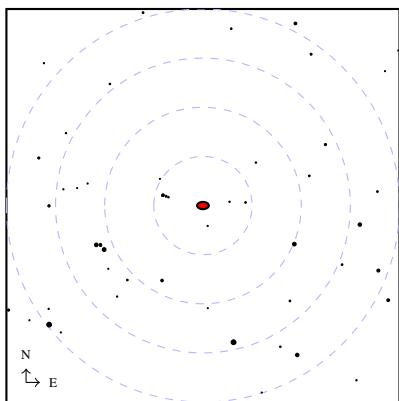
M103 = NGC 581



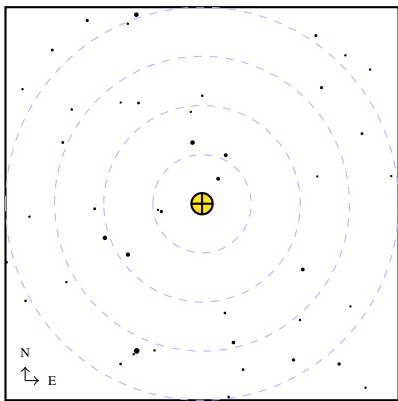
M106 = NGC 4258



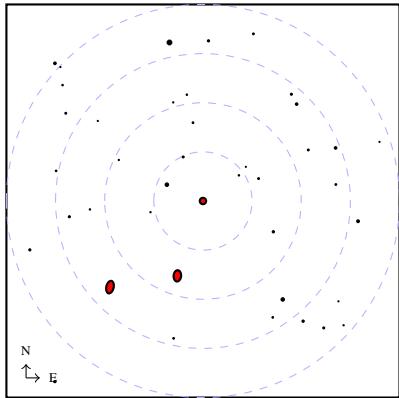
M104 = U48 = NGC 4594 = Sombrero Galaxy



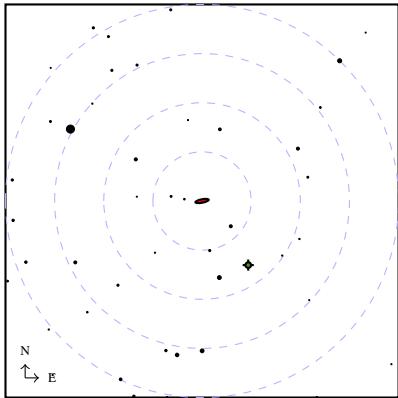
M107 = NGC 6171



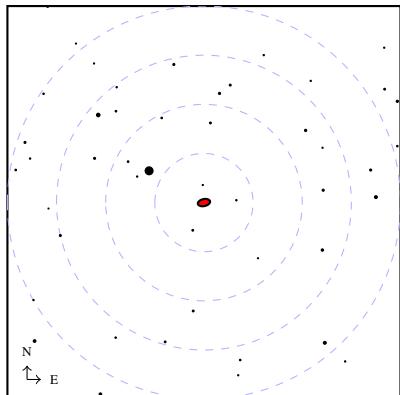
M105 = NGC 3379



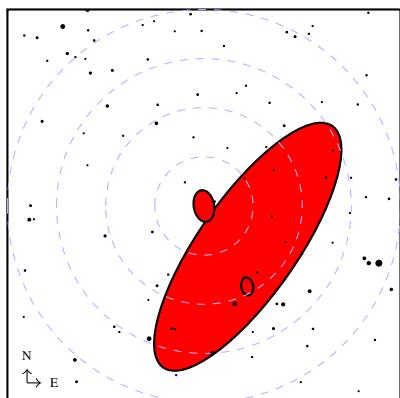
M108 = NGC 3556



M109 = NGC 3992



M110 = NGC 205





## Chapter 2

# The Caldwell Objects

The Caldwell objects were selected by Patrick Moore as a complement to the Messier objects. Again, I find O'Meara's *Deep-Sky Companion: The Caldwell Objects* to be excellent on the origin of the catalog, the appearance of the objects, and their nature.

I use C1 to C109 to label the Caldwell objects. This is common practice, but does not confirm to the IAU's recommendation on nomenclature, as O'Meara rightly notes (pp. 14–15).

The following table lists the objects with their J2000 positions (decimal hours of right ascension and degrees of declination), the charts on which they appear in the *Pocket Sky Atlas*, their types, and other names. I follow the corrections given by O'Meara (p. 15) with regards to C37, C49, C89, and C100.

For completeness, I include finder charts for all of the Caldwell objects, even bright ones like C41 (the Hyades).

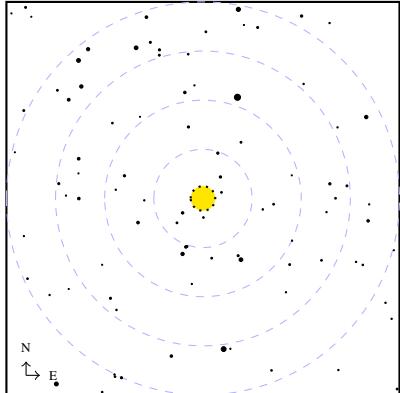
I note that C41 (the Hyades) and C99 (the Coalsack Nebula) are much bigger than the finder charts. They are really binocular objects and are better located using a small-scale all-sky atlas.

Name	Position	PSA	Type	Other Names
C1	00.8 +85	1	OC	NGC 188
C2	00.2 +73	1/71	PN	NGC 40 = Bow-Tie Nebula
C3	12.3 +69	31/41	Gal	NGC 4236
C4	21.0 +68	61/71	BN	NGC 7023 = Iris Nebula
C5	03.8 +68	1/11	Gal	IC 342 = Hidden Galaxy
C6	18.0 +67	51/61	PN	NGC 6543 = Cat's Eye Nebula
C7	07.6 +66	21	Gal	NGC 2403
C8	01.5 +63	1/3	OC	NGC 559
C9	23.0 +63	71/72	BN	Cave Nebula
C10	01.8 +61	1/2	OC	NGC 663
C11	23.3 +61	71/72	BN	NGC 7635 = Bubble Nebula
C12	20.6 +60	61/62	Gal	NGC 6946 = Firecracker Galaxy
C13	01.3 +58	1/3	OC	NGC 457 = Owl Cluster
C14	02.3 +57	1/2	FC	NGC 869/884 = Double Cluster
C15	19.7 +51	62	PN	NGC 6826 = Blinking Planetary
C16	22.3 +50	73	OC	NGC 7243
C17	00.6 +49	3	Gal	NGC 147
C18	00.6 +48	3	Gal	NGC 185
C19	21.9 +47	73	BN	IC 5146 = Cocoon Nebula
C20	21.0 +44	62	BN	NGC 7000 = North America Nebula
C21	12.5 +44	32/43	Gal	NGC 4449
C22	23.4 +43	72	PN	NGC 7662 = Light Blue Snowball
C23	02.4 +42	2	Gal	NGC 891
C24	03.3 +42	13	Gal	NGC 1275 = Per A
C25	07.6 +39	23	GC	NGC 2419
C26	12.3 +38	32/43	Gal	NGC 4244
C27	20.2 +38	62	BN	NGC 6888 = Crescent Nebula
C28	01.9 +38	2	OC	NGC 752
C29	13.2 +37	43	Gal	NGC 5005
C30	22.6 +34	72/74	Gal	NGC 7331
C31	05.3 +34	12	BN	IC 405 = Flaming Star Nebula
C32	12.7 +33	43/45	Gal	NGC 4631 = Whale Galaxy
C33	20.9 +32	62	BN	NGC 6992 = Eastern Veil Nebula
C34	20.8 +31	62	BN	NGC 6960 = Western Veil Nebula
C35	13.0 +28	43/45	Gal	NGC 4889
C36	12.6 +28	43/45	Gal	NGC 4559
C37	20.2 +26	62/64	OC	NGC 6885
C38	12.6 +26	43/45	Gal	NGC 4565 = Needle Galaxy
C39	07.5 +21	25	PN	NGC 2392 = Eskimo Nebula
C40	11.3 +18	34	Gal	NGC 3626

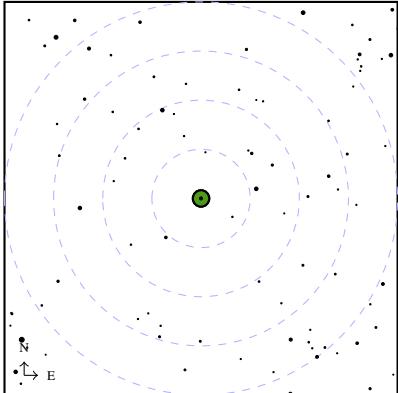
Name	Position	PSA	Type	Other Names
C41	04.4 +16	15	OC	Mel 25 = Hyades
C42	21.0 +16	64/75	GC	NGC 7006
C43	00.1 +16	5/74	Gal	NGC 7814
C44	23.1 +12	74	Gal	NGC 7479
C45	13.6 +09	44	Gal	NGC 5248
C46	06.7 +09	25/E	BN	NGC 2261 = Hubble's Variable Nebula
C47	20.6 +07	64	GC	NGC 6934
C48	09.2 +07	24/35	Gal	NGC 2775
C49	06.5 +05	25/E	BN	NGC 2237/38/46 = Rosette Nebula
C50	06.5 +05	25/E	OC	NGC 2244
C51	01.1 +02	5/7	Gal	IC 1613
C52	12.8 -06	47	Gal	NGC 4697
C53	10.1 -08	37	Gal	NGC 3115 = The Spindle
C54	08.0 -11	26	OC	NGC 2506
C55	21.1 -11	77	PN	NGC 7009 = Saturn Nebula
C56	00.8 -12	7	PN	NGC 246
C57	19.7 -15	66	Gal	NGC 6822 = Barnard's Galaxy
C58	07.3 -16	27	OC	NGC 2360 = Caroline's Cluster
C59	10.4 -19	36/37	PN	NGC 3242 = Ghost of Jupiter
C60	12.0 -19	36/47	Gal	NGC 4038 = NW Antennae Galaxy
C61	12.0 -19	36/47	Gal	NGC 4039 = SE Antennae Galaxy
C62	00.8 -21	7	Gal	NGC 247
C63	22.5 -21	76/77	PN	NGC 7293 = Helix Nebula
C64	07.3 -25	27	OC	NGC 2362 = $\tau$ CMa Cluster
C65	00.8 -25	7/9	Gal	NGC 253 = Sculptor Galaxy
C66	14.7 -27	46	GC	NGC 5694
C67	02.8 -30	6/8	Gal	NGC 1097
C68	19.0 -37	69	BN	NGC 6729 = R CrA Nebula
C69	17.2 -37	58	PN	NGC 6302 = Bug Nebula
C70	00.9 -38	9	Gal	NGC 300
C71	07.9 -39	28	OC	NGC 2477
C72	00.2 -39	9	Gal	NGC 55
C73	05.2 -40	18	GC	NGC 1851
C74	10.1 -40	39	PN	NGC 3132
C75	16.4 -41	58	OC	NGC 6124
C76	16.9 -42	58	OC	NGC 6231
C77	13.4 -43	48/49	Gal	NGC 5128 = Cen A
C78	18.1 -44	69	GC	NGC 6541
C79	10.3 -46	39	GC	NGC 3201
C80	13.4 -47	48/49	GC	NGC 5139 = $\omega$ Cen

Name	Position	PSA	Type	Other Names
C81	17.4 –48	58	GC	NGC 6352
C82	16.7 –49	58	OC	NGC 6193
C83	13.1 –49	49	Gal	NGC 4945
C84	13.8 –51	48	GC	NGC 5286
C85	08.7 –53	28	OC	IC 2391 = o Vel Cluster
C86	17.7 –54	58	GC	NGC 6397
C87	03.2 –55	19	GC	NGC 1261
C88	15.1 –56	59	OC	NGC 5823
C89	16.3 –58	58/60	OC	NGC 6087 = S Nor Cluster
C90	09.4 –58	39	PN	NGC 2867
C91	11.1 –59	38/40	OC	NGC 3532
C92	10.8 –60	38/40	BN	NGC 3372 = $\eta$ Car Nebula
C93	19.2 –60	69/70	GC	NGC 6752
C94	12.9 –60	49/50	OC	NGC 4755 = Jewel Box
C95	16.1 –60	59/60	OC	NGC 6025
C96	08.0 –61	28/30	OC	NGC 2516 = Southern Beehive Cluster
C97	11.6 –62	38/40	OC	NGC 3766
C98	12.7 –63	49/50	OC	NGC 4609
C99	12.5 –64	49/50	DN	Coalsack
C100	11.6 –63	38/40	OC	Cr 249 = $\lambda$ Cen Cluster
C101	19.2 –64	70	Gal	NGC 6744
C102	10.7 –64	38/40	OC	IC 2602 = $\theta$ Car Cluster
C103	05.6 –69	20/30/D	BN	NGC 2070 = Tarantula Nebula
C104	01.1 –71	10/80	GC	NGC 362
C105	13.0 –71	50	GC	NGC 4833
C106	00.4 –72	10/80	GC	NGC 104 = 47 Tuc
C107	16.4 –72	60	GC	NGC 6101
C108	12.4 –73	40/50	GC	NGC 4372
C109	10.2 –81	40	PN	NGC 3195

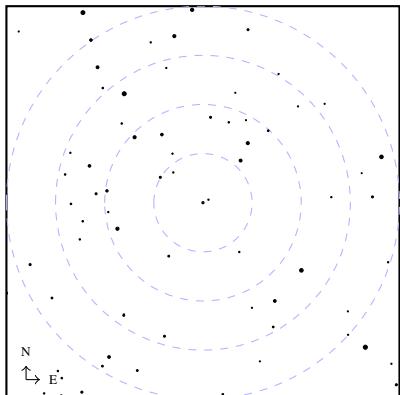
C1 = NGC 188



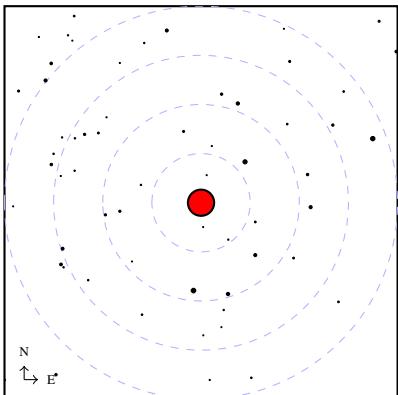
C4 = NGC 7023 = Iris Nebula



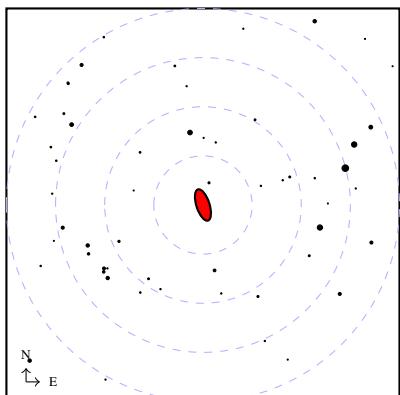
C2 = NGC 40 = Bow-Tie Nebula



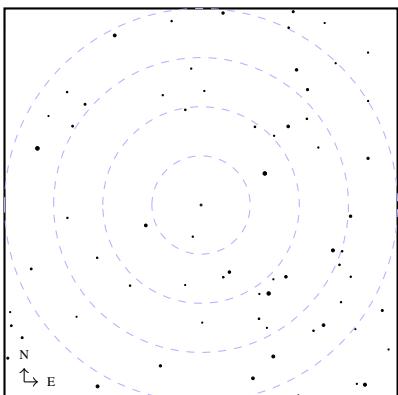
C5 = IC 342 = Hidden Galaxy



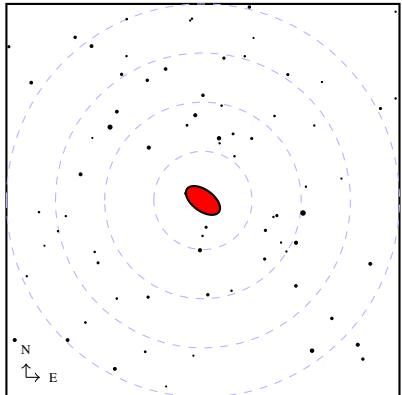
C3 = NGC 4236



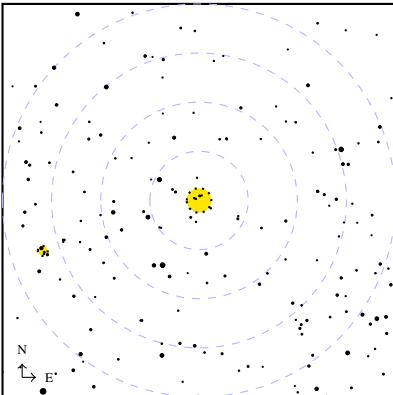
C6 = NGC 6543 = Cat's Eye Nebula



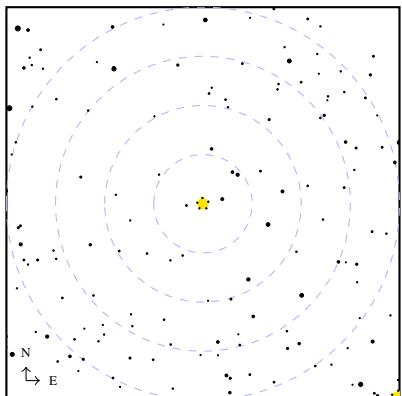
C7 = NGC 2403



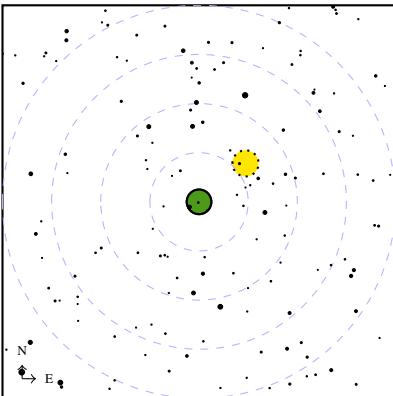
C10 = U5 = NGC 663



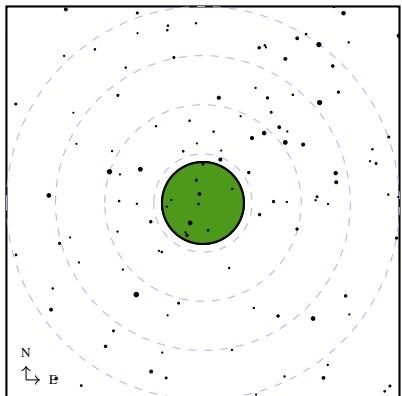
C8 = NGC 559



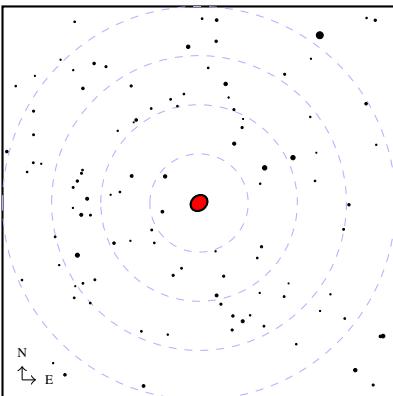
C11 = NGC 7635 = Bubble Nebula



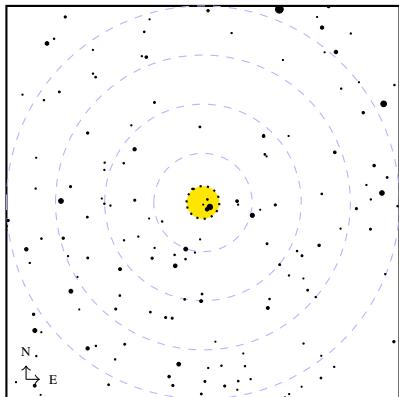
C9 = Cave Nebula



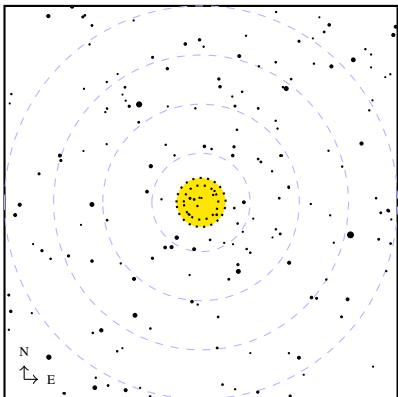
C12 = NGC 6946 = Firecracker Galaxy



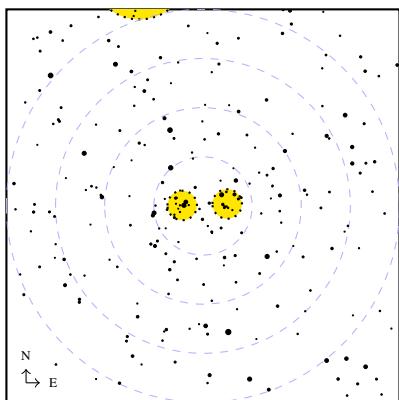
C13 = U4 = NGC 457 = Owl Cluster



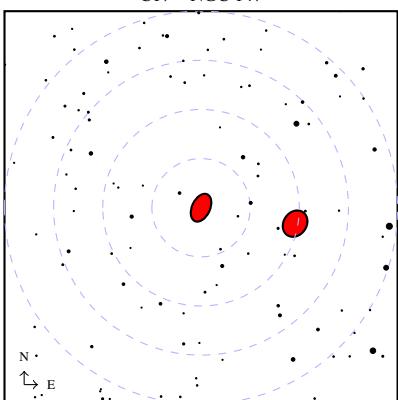
C16 = NGC 7243



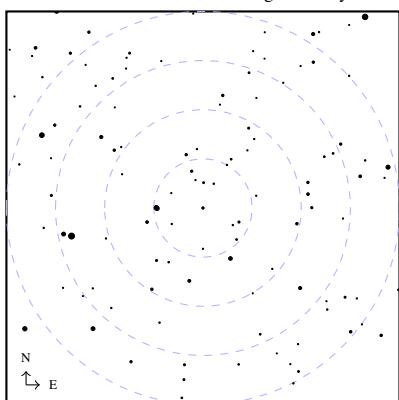
C14 = U9/10 = NGC 869/884 = Double Cluster



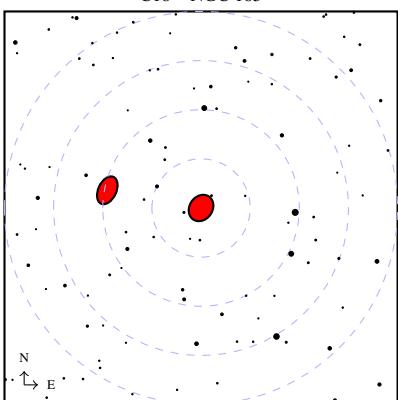
C17 = NGC 147



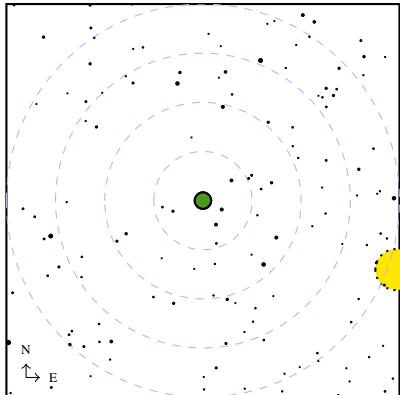
C15 = NGC 6826 = Blinking Planetary



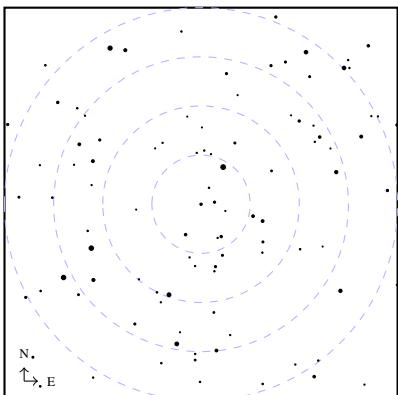
C18 = NGC 185



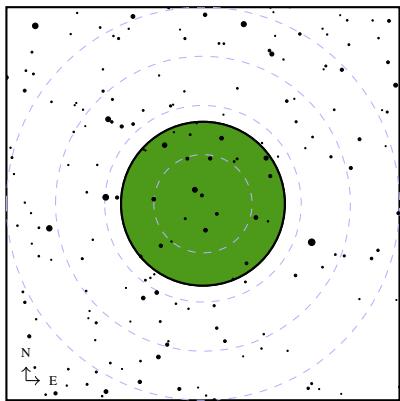
C19 = IC 5146 = Cocoon Nebula



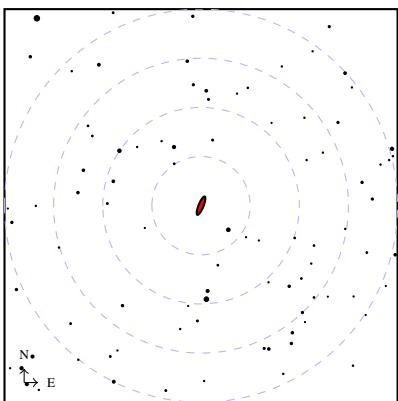
C22 = NGC 7662 = Light Blue Snowball



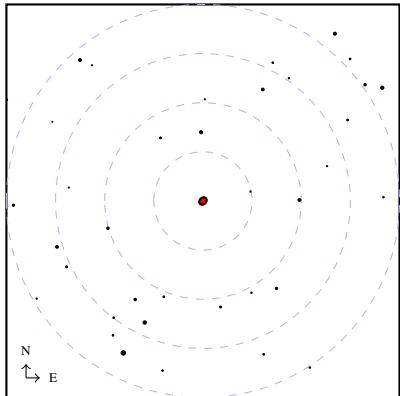
C20 = NGC 7000 = North America Nebula



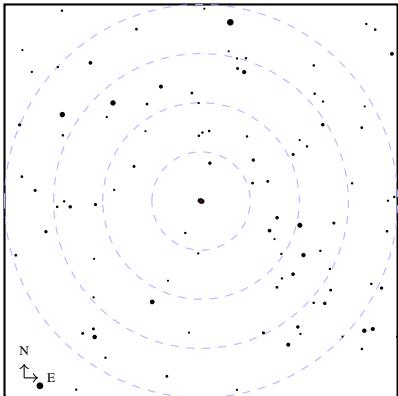
C23 = NGC 891



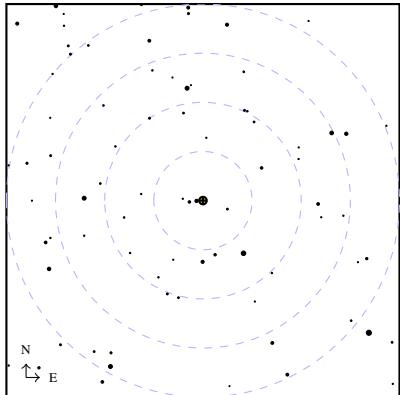
C21 = NGC 4449



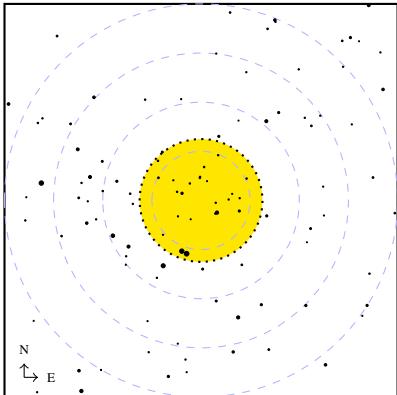
C24 = NGC 1275 = Per A



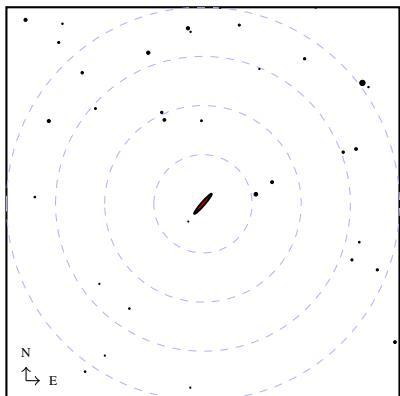
C25 = NGC 2419



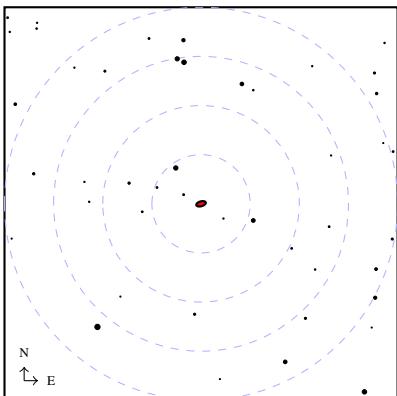
C28 = U7 = NGC 752



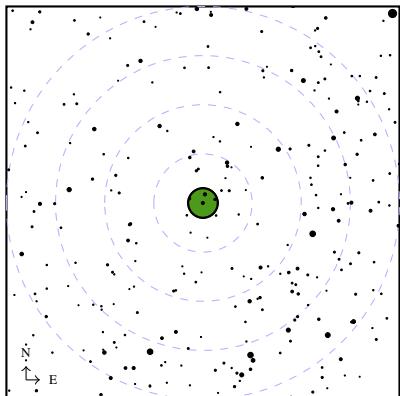
C26 = NGC 4244



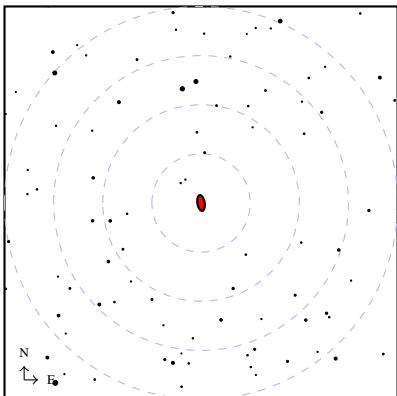
C29 = NGC 5005



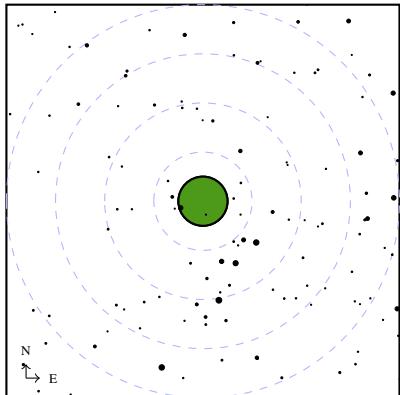
C27 = NGC 6888 = Crescent Nebula



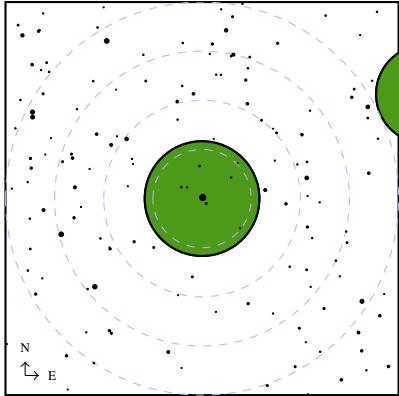
C30 = NGC 7331



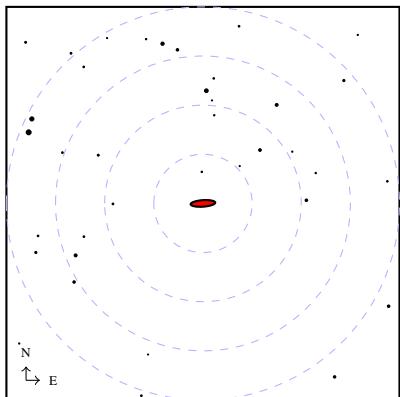
C31 = IC 405 = Flaming Star Nebula



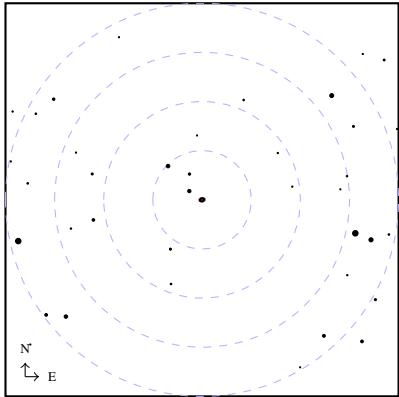
C34 = NGC 6960 = Western Veil Nebula



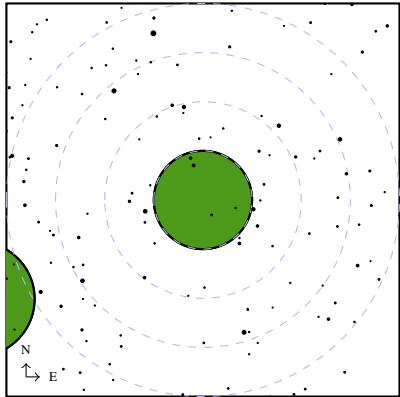
C32 = NGC 4631 = Whale Galaxy



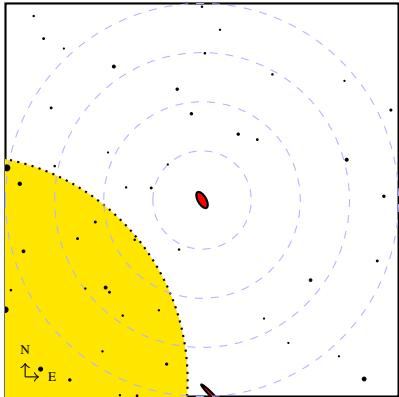
C35 = NGC 4889



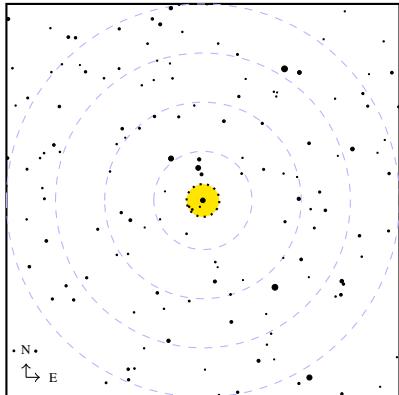
C33 = NGC 6992 = Eastern Veil Nebula



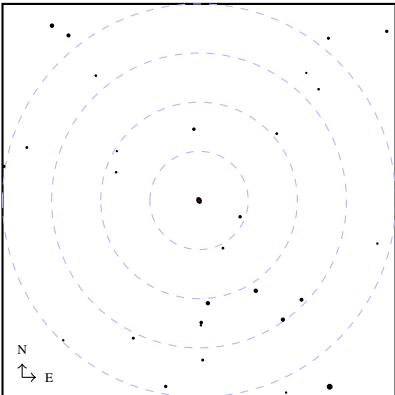
C36 = NGC 4559



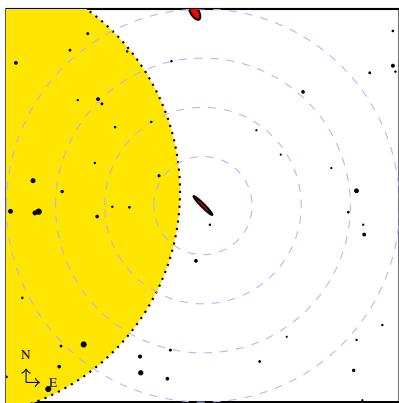
C37 = NGC 6885



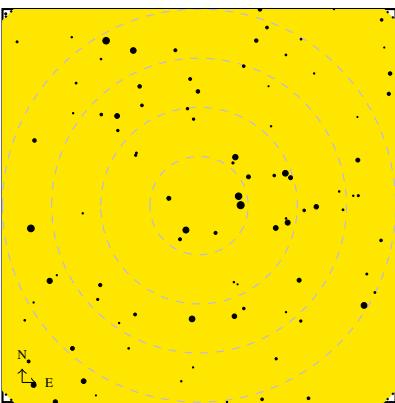
C40 = NGC 3626



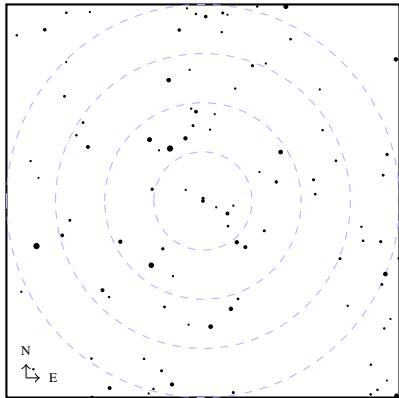
C38 = NGC 4565 = Needle Galaxy



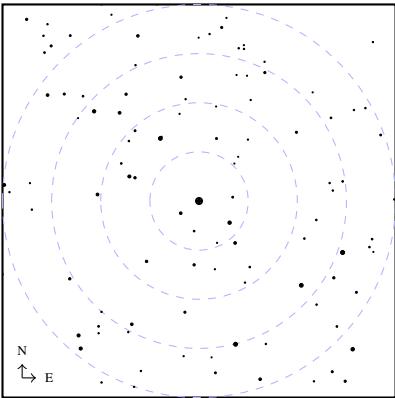
C41 = U18 = Mel 25 = Hyades



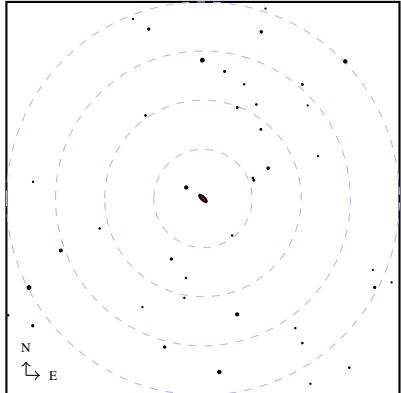
C39 = U36 = NGC 2392 = Eskimo Nebula



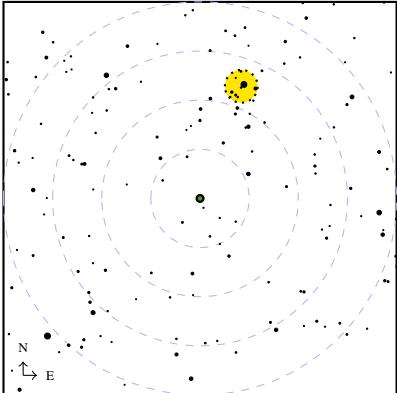
C42 = NGC 7006



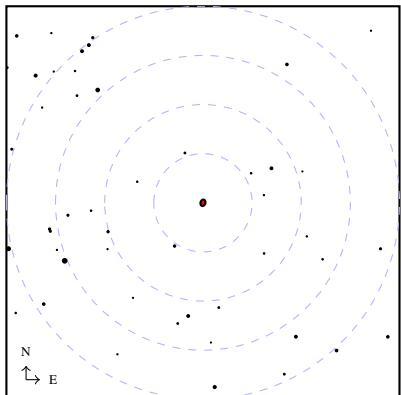
C43 = NGC 7814



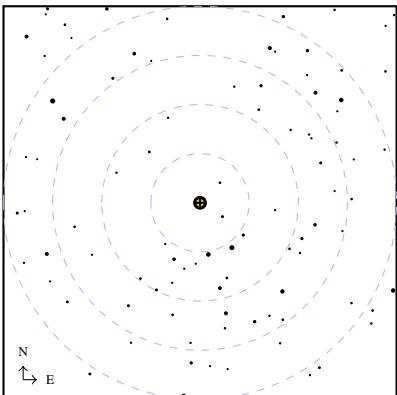
C46 = NGC 2261 = Hubble's Variable Nebula



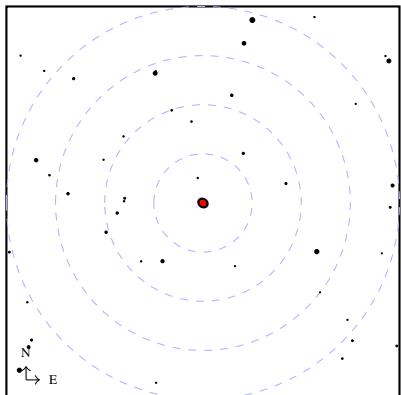
C44 = NGC 7479



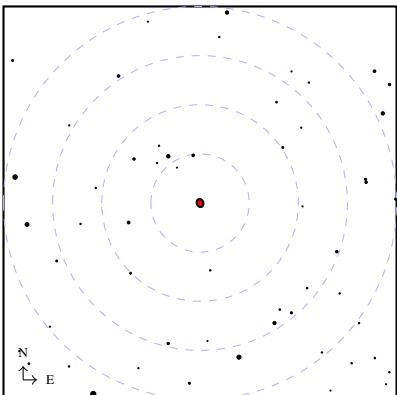
C47 = NGC 6934



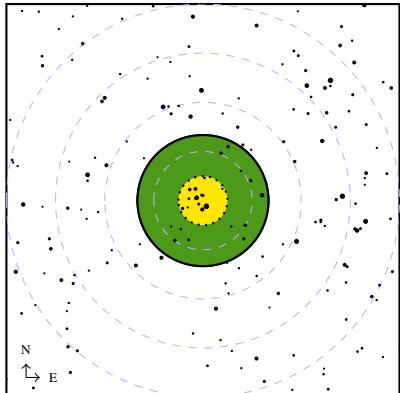
C45 = NGC 5248



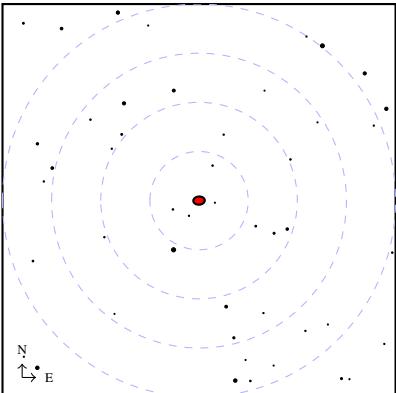
C48 = NGC 2775



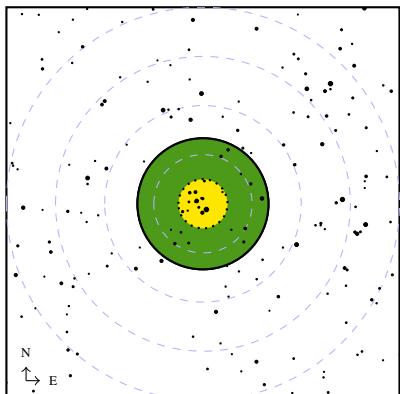
C49 = NGC 2237/38/46 = Rosette Nebula



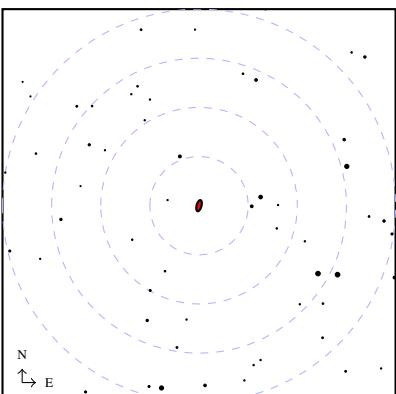
C52 = NGC 4697



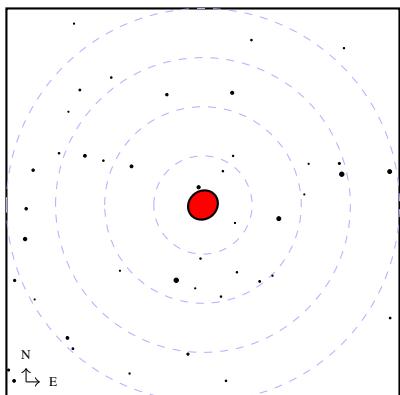
C50 = U30 = NGC 2244



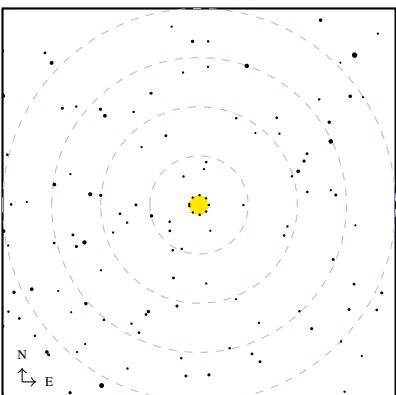
C53 = NGC 3115 = The Spindle



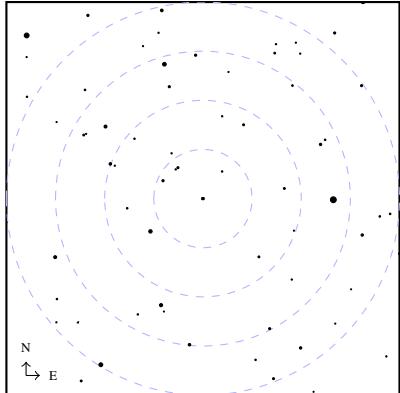
C51 = IC 1613



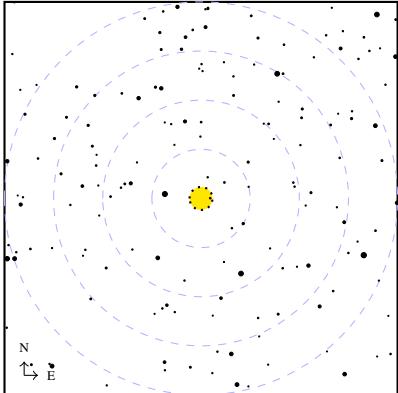
C54 = NGC 2506



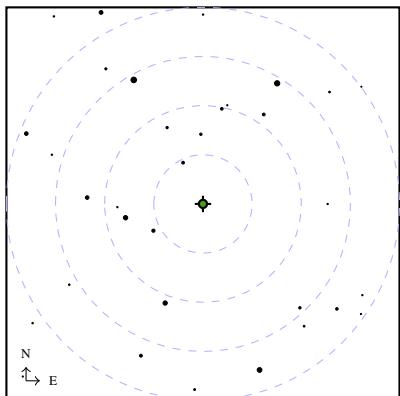
C55 = NGC 7009 = Saturn Nebula



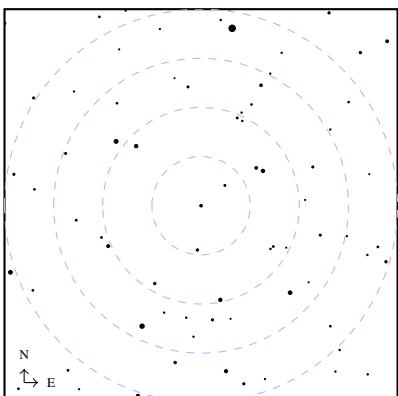
C58 = NGC 2360 = Caroline's Cluster



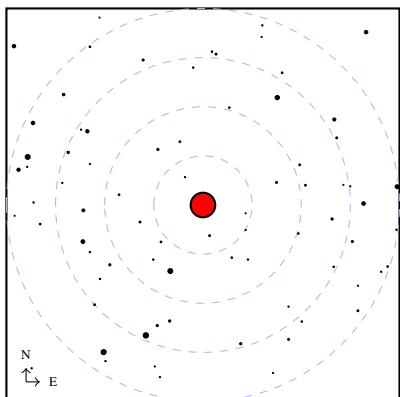
C56 = NGC 246



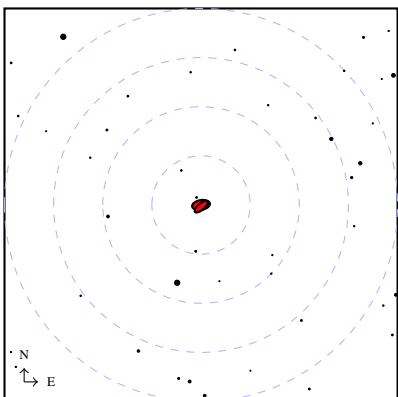
C59 = U43 = NGC 3242 = Ghost of Jupiter



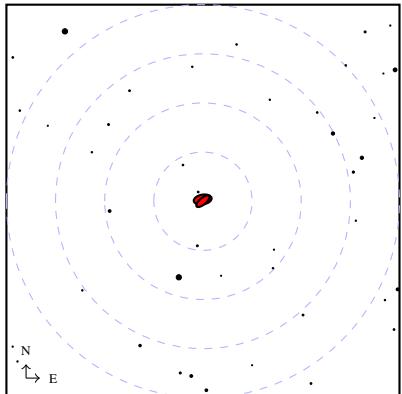
C57 = NGC 6822 = Barnard's Galaxy



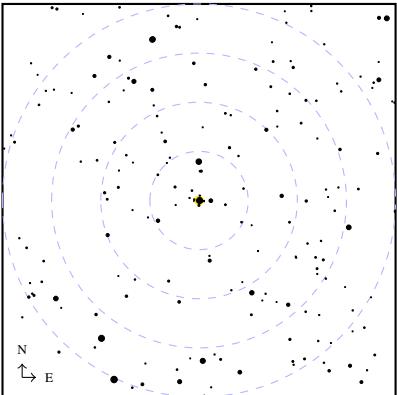
C60 = NGC 4038 = NW Antennae Galaxy



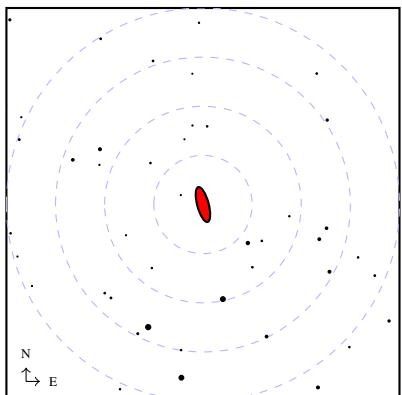
C61 = NGC 4039 = SE Antennae Galaxy



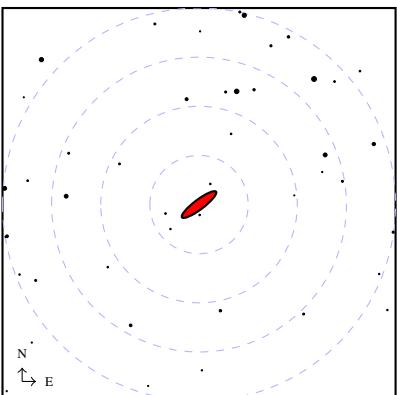
C64 = NGC 2362 =  $\tau$  CMa Cluster



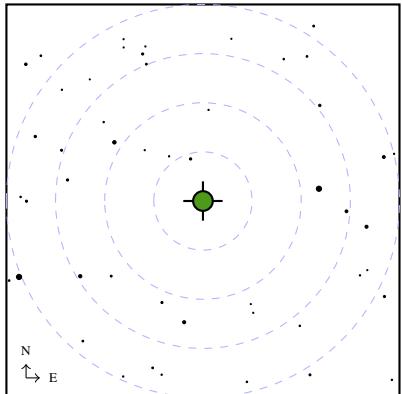
C62 = NGC 247



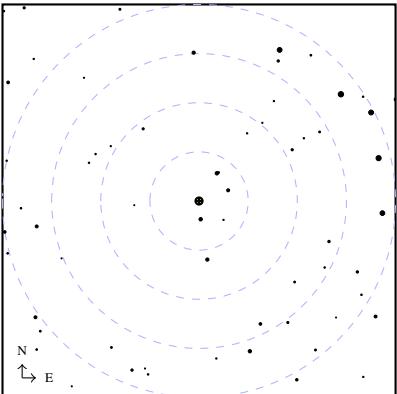
C65 = NGC 253 = Sculptor Galaxy



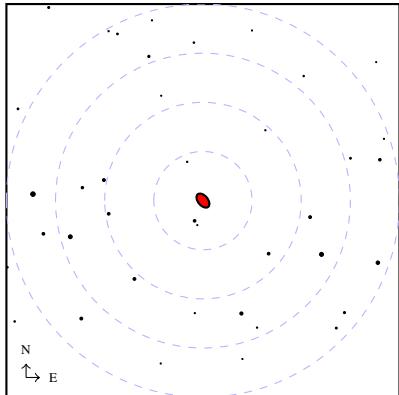
C63 = NGC 7293 = Helix Nebula



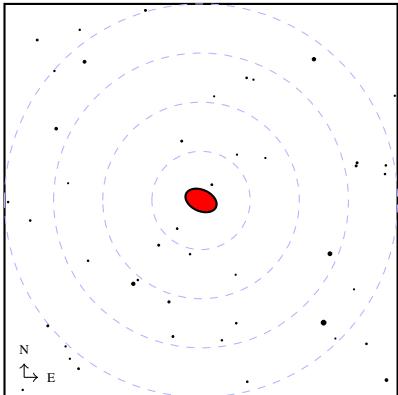
C66 = NGC 5694



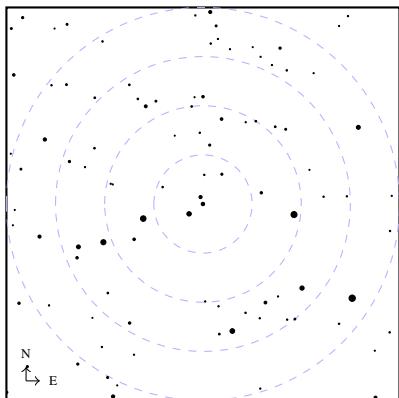
C67 = NGC 1097



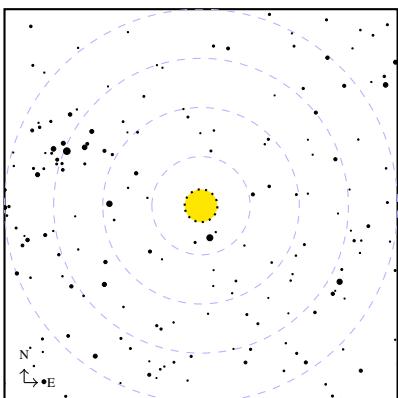
C70 = NGC 300



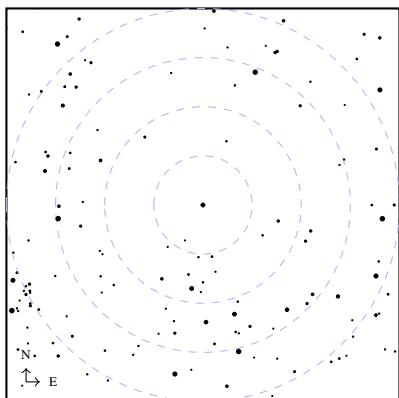
C68 = NGC 6729 = R CrA Nebula



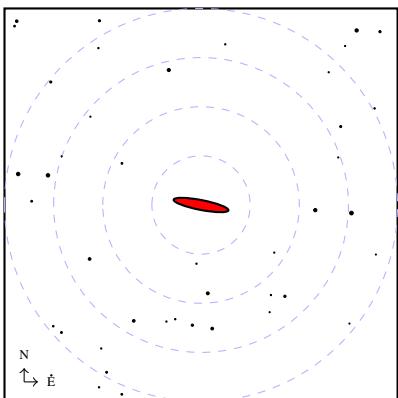
C71 = NGC 2477



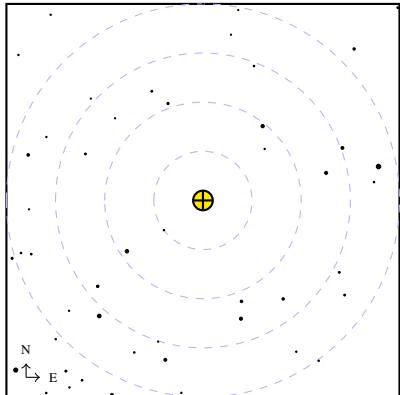
C69 = NGC 6302 = Bug Nebula



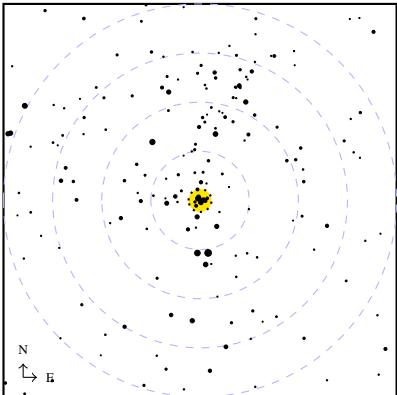
C72 = NGC 55



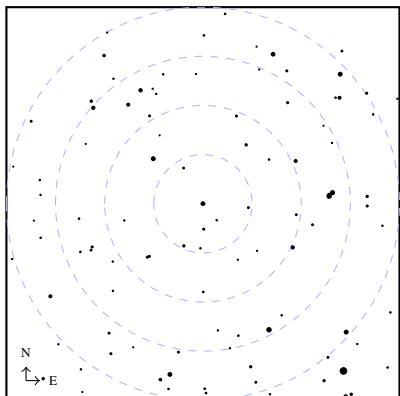
C73 = NGC 1851



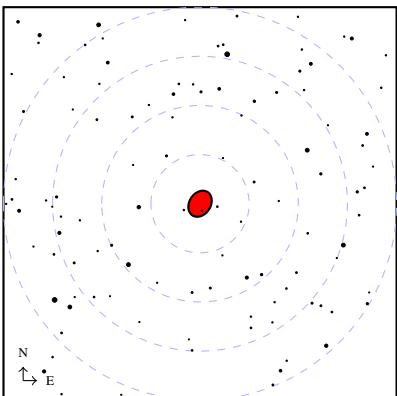
C76 = NGC 6231



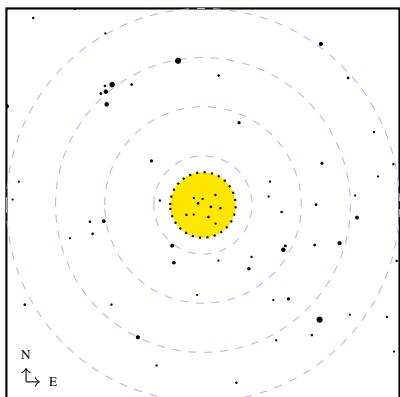
C74 = NGC 3132



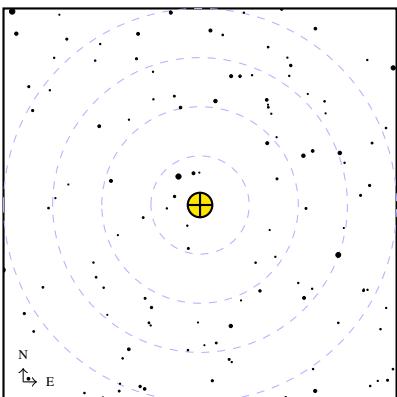
C77 = NGC 5128 = Cen A



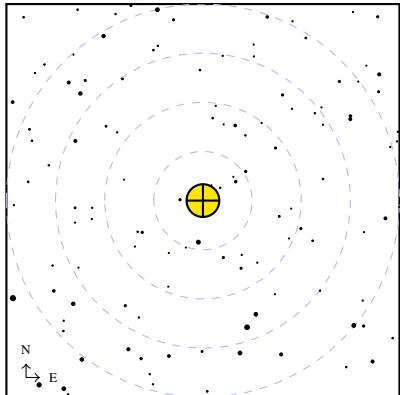
C75 = NGC 6124



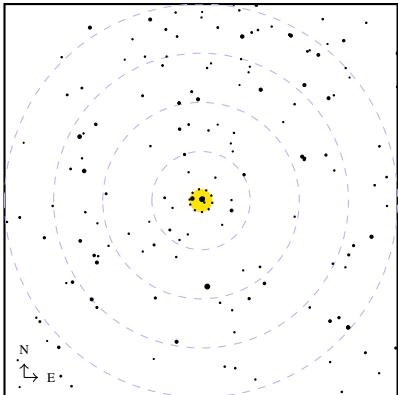
C78 = NGC 6541



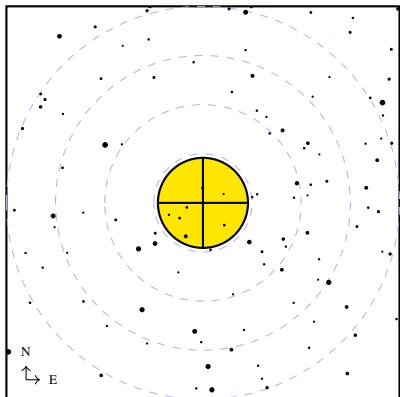
C79 = NGC 3201



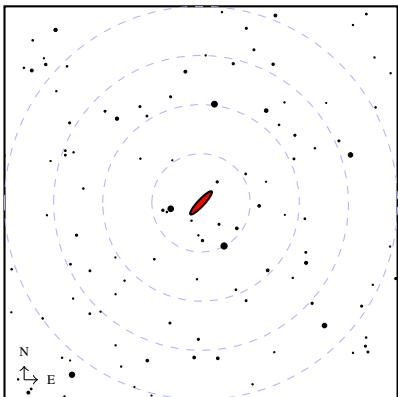
C82 = NGC 6193



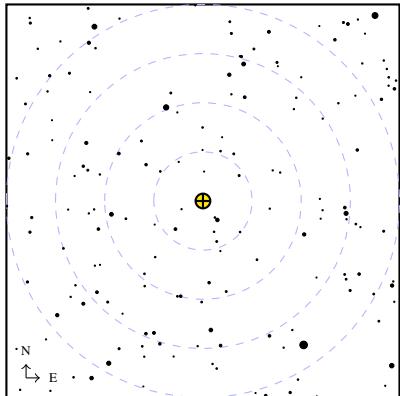
C80 = NGC 5139 =  $\omega$  Cen



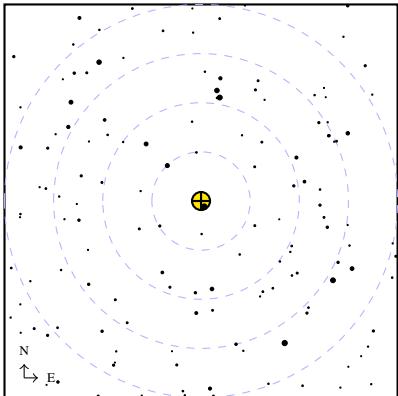
C83 = NGC 4945



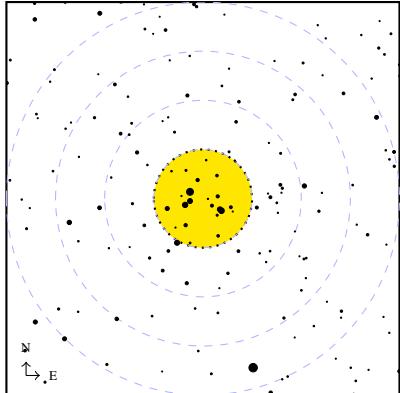
C81 = NGC 6352



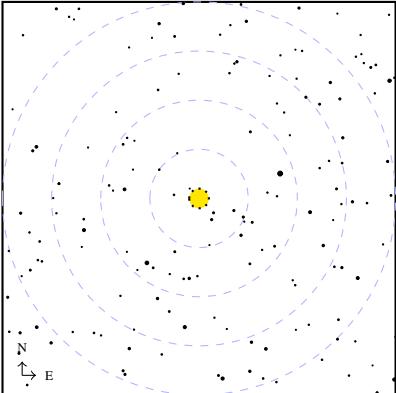
C84 = NGC 5286



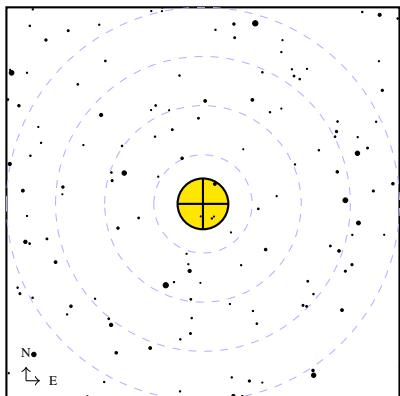
C85 = IC 2391 =  $\sigma$  Vel Cluster



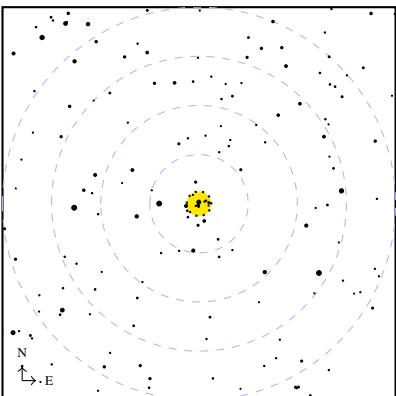
C88 = NGC 5823



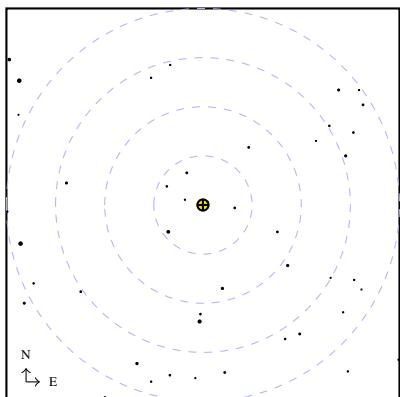
C86 = NGC 6397



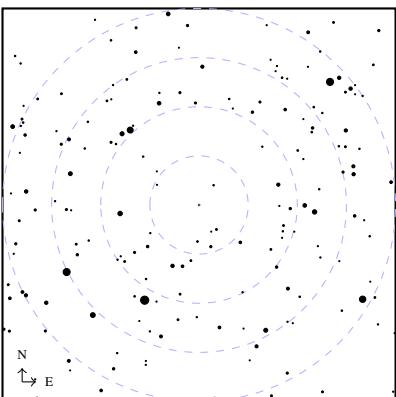
C89 = NGC 6087 = S Nor Cluster



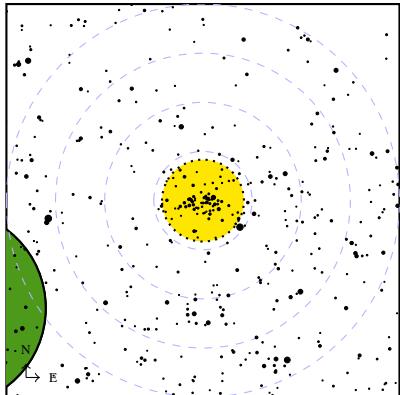
C87 = NGC 1261



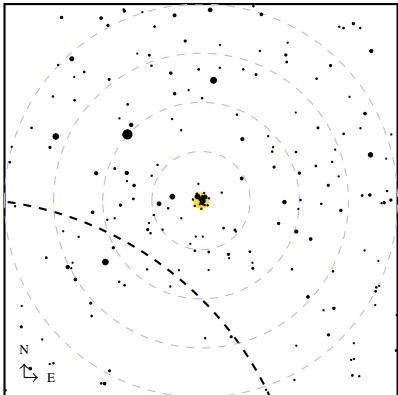
C90 = NGC 2867



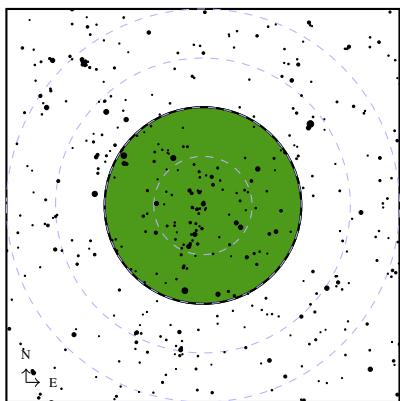
C91 = NGC 3532



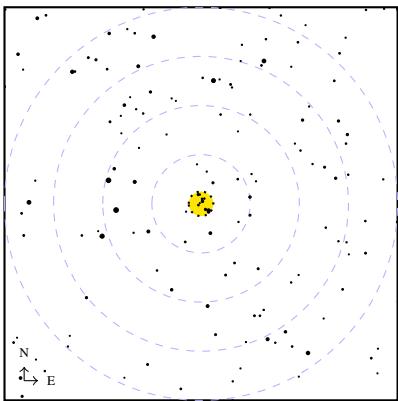
C94 = NGC 4755 = Jewel Box



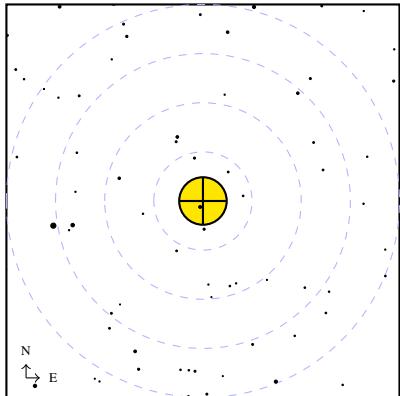
C92 = NGC 3372 =  $\eta$  Car Nebula



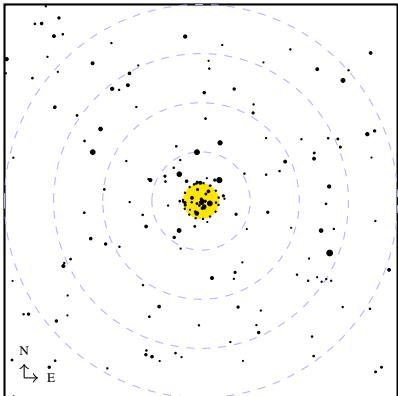
C95 = NGC 6025



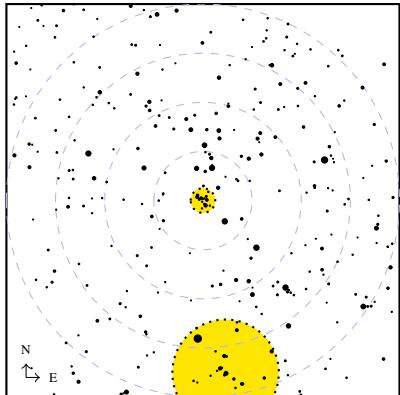
C93 = NGC 6752



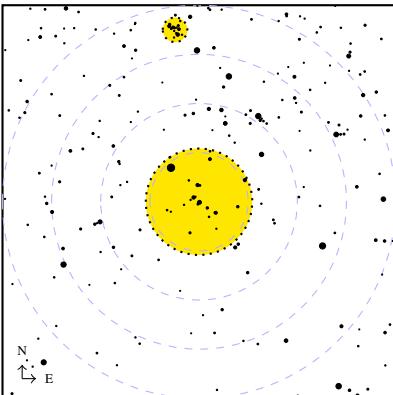
C96 = NGC 2516 = Southern Beehive Cluster



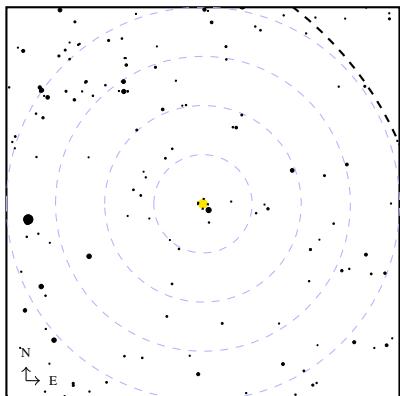
C97 = NGC 3766



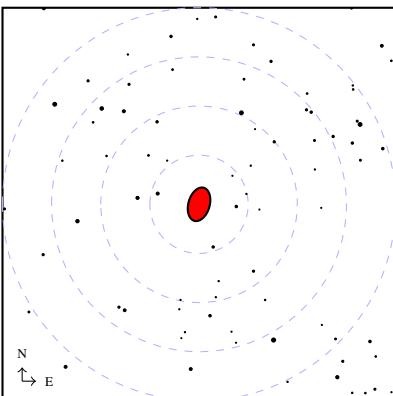
C100 = Cr 249 =  $\lambda$  Cen Cluster



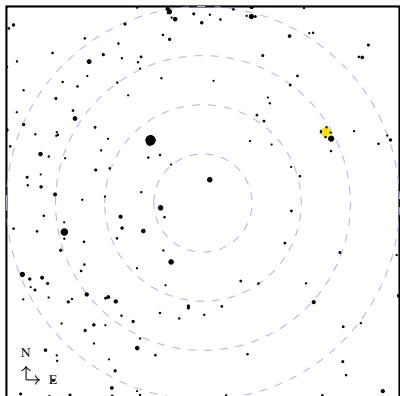
C98 = NGC 4609



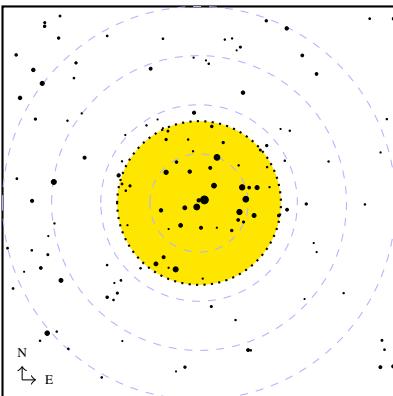
C101 = NGC 6744



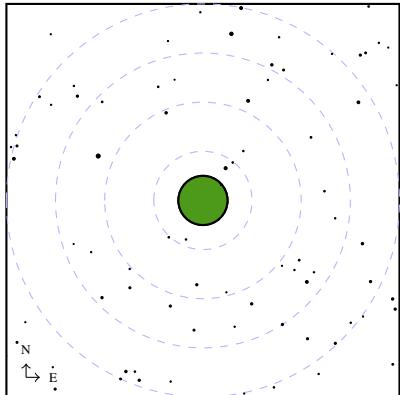
C99 = Coalsack



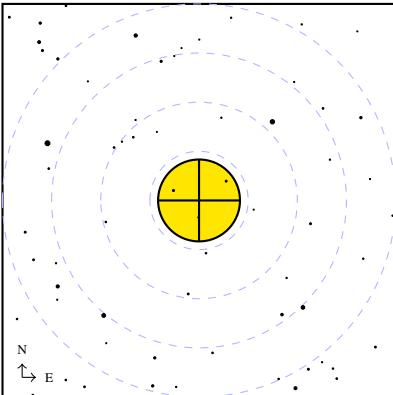
C102 = IC 2602 =  $\theta$  Car Cluster



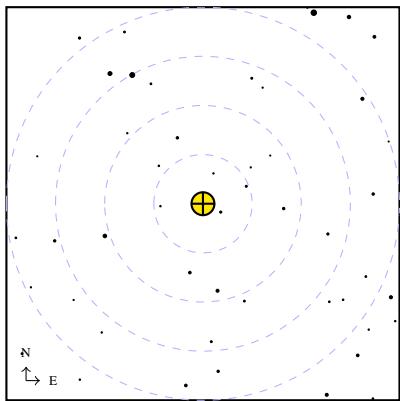
C103 = NGC 2070 = Tarantula Nebula



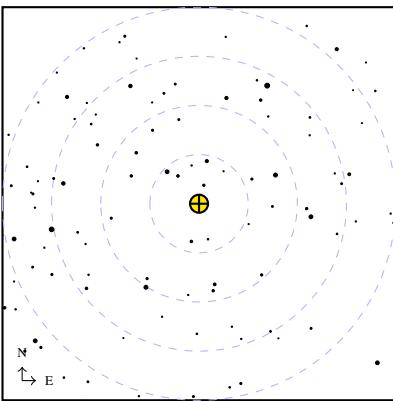
C106 = NGC 104 = 47 Tuc



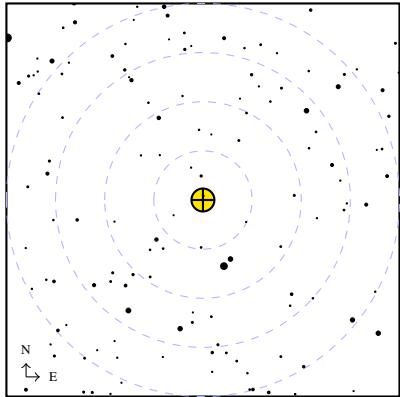
C104 = NGC 362



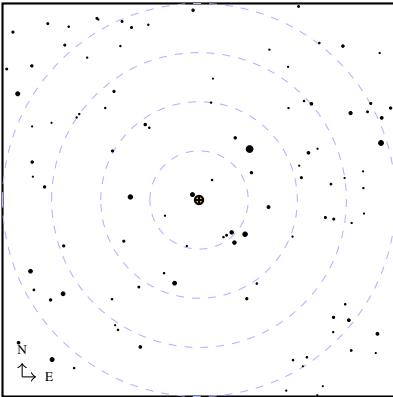
C107 = NGC 6101



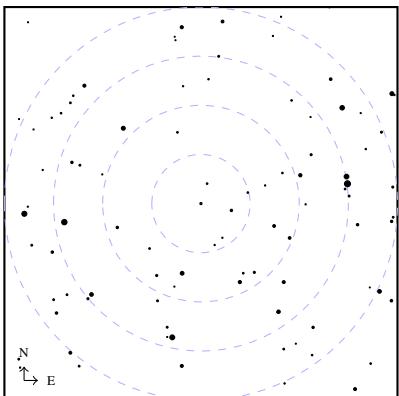
C105 = NGC 4833



C108 = NGC 4372



C109 = NGC 3195





## Chapter 3

# The Urban Observing Program Objects

The Astronomical League Urban Observing Program consists of bright objects selected by Terry Trees for northern observers under light-polluted skies. There are 87 deep-sky objects, 12 double stars, and 1 variable star. The deep-sky objects range in declination from  $-35$  to  $+72$  degrees, cover all seasons, and include 41 Messier objects and 14 Caldwell objects.

I give finder charts for the deep-sky objects only; the stars are all no fainter than magnitude 5.2 and have Bayer designations, and so a standard all-sky atlas is adequate. I use U1 to U87 to label the deep-sky objects, following the order in right ascension given by Trees, but this is not a standard designation. For completeness, I include all of the deep-sky objects, even bright ones like the Hyades (U18).

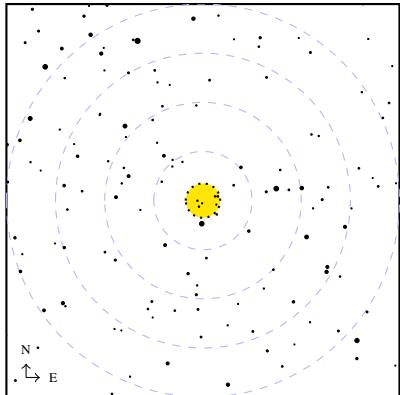
The following table lists the deep-sky objects with their J2000 positions (decimal hours of right ascension and degrees of declination), the charts on which they appear in the *Pocket Sky Atlas*, their types, other names, and references to O'Meara's *Deep-Sky Companions* volumes (*The Messier Objects*, *The Caldwell Objects*, *The Secret Deep*, and *Hidden Treasures*).

I note that the Hyades (U18) and Coma Star Cluster (U44) are much bigger than the finder charts. They are really binocular objects and better located using a small-scale all-sky atlas. That said, be aware that the  $\alpha$  Per Cluster (U15) and Coma Star Cluster (U44) are not labelled in the *Pocket Sky Atlas*.

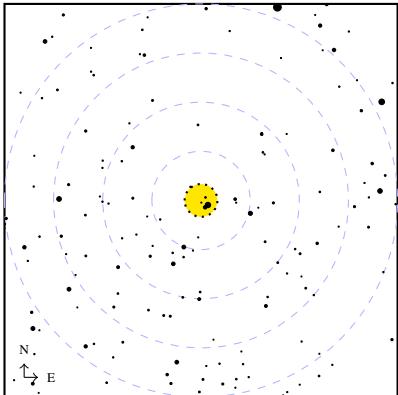
Name	Position	PSA	Type	Other Names	DSC
U1	00.5 +60	3	OC	NGC 129	TSD
U2	00.7 +41	3	Gal	M32 = NGC 221	TMO
U3	00.7 +41	3	Gal	M31 = NGC 224 = Andromeda Galaxy	TMO
U4	01.3 +58	1/3	OC	C13 = NGC 457 = Owl Cluster	TCO
U5	01.8 +61	1/2	OC	C10 = NGC 663	TCO
U6	01.8 +72	1	OC	Cr 463	TSD
U7	01.9 +38	2	OC	C28 = NGC 752	TCO
U8	02.3 +60	2	OC	Stock 2	TSD
U9	02.3 +57	2	OC	NGC 869 = h Persei Cluster	TMO/TCO
U10	02.4 +57	2	OC	NGC 884 = $\chi$ Persei Cluster	TMO/TCO
U11	02.6 +56	2	OC	Tr 2	
U12	02.7 -00	4	Gal	M77 = NGC 1068	TMO
U13	03.2 +63	11/13	OC	Tr 3	
U14	03.3 +60	11/13	OC	Stock 23 = Pazmino's Cluster	
U15	03.4 +49	3	OC	Mel 20 = $\alpha$ Per Cluster	
U16	03.5 +37	13	OC	NGC 1342	TSD
U17	03.8 +24	15/A	OC	M45 = Mel 22 = Pleiades	TMO
U18	04.4 +16	15	OC	C41 = Mel 25 = Hyades	TCO
U19	04.8 +19	15	OC	NGC 1647	TCO/HT
U20	05.2 +17	14	OC	NGC 1807	TSD
U21	05.2 +17	14	OC	NGC 1817	TSD
U22	05.5 +36	12	OC	M38 = NGC 1912	TMO
U23	05.6 +34	12	OC	M36 = NGC 1960	TMO
U24	05.6 -05	16/B	BN	M42 = NGC 1976 = Orion Nebula	TMO
U25	05.6 -04	16/B	OC	NGC 1981	HT
U26	05.9 +33	12	OC	M37 = NGC 2099	TMO
U27	06.2 +24	14	OC	M35 = NGC 2168	TMO
U28	06.1 +14	14/25	OC	NGC 2169	HT
U29	06.5 -05	25/27	OC	NGC 2232	TSD
U30	06.5 +05	25/E	OC	C50 = NGC 2244	TCO
U31	06.7 +10	25/E	OC	NGC 2264	HT
U32	06.8 +41	23	OC	NGC 2281	TSD
U33	06.8 -21	27	OC	M41 = NGC 2287	TMO
U34	06.9 +00	25/27	OC	NGC 2301	HT
U35	07.0 -08	27	OC	M50 = NGC 2323	TMO
U36	07.5 +21	25	PN	C39 = NGC 2392 = Eskimo Nebula	TMO/TCO
U37	08.2 -13	26	OC	NGC 2539	HT
U38	08.2 -06	26	OC	M48 = NGC 2548	TMO
U39	08.7 +20	24	OC	M44 = NGC 2632 = Beehive Cluster	TMO
U40	08.9 +12	24	OC	M67 = NGC 2682	TMO
U41	09.9 +69	31	Gal	M81 = NGC 3031	TMO
U42	09.9 +70	31	Gal	M82 = NGC 3034	TMO
U43	10.4 -19	36/37	PN	C59 = NGC 3242 = Ghost of Jupiter	TMO/TCO
U44	12.4 +26	45	OC	Mel 111 = Coma Star Cluster	HT

Name	Position	PSA	Type	Other Names	DSC
U45	12.4 +13	45/C	Gal	M84 = NGC 4374	TMO
U46	12.4 +13	45/C	Gal	M86 = NGC 4406	TMO
U47	12.5 +12	45/C	Gal	M87 = NGC 4486	TMO
U48	12.7 -12	47	Gal	M104 = NGC 4594 = Sombrero Galaxy	TMO
U49	12.8 +41	43	Gal	M94 = NGC 4736	TMO
U50	12.9 +22	45	Gal	M64 = NGC 4826 = Black-Eye Galaxy	TMO
U51	13.7 +28	43/44	GC	M3 = NGC 5272	TMO
U52	15.3 +02	55/57	GC	M5 = NGC 5904	TMO
U53	16.4 -27	56/58	GC	M4 = NGC 6121	TMO
U54	16.7 +36	52	GC	M13 = NGC 6205 = Hercules Cluster	TMO
U55	16.7 +24	54	PN	NGC 6210	HT
U56	16.8 -02	54/56	GC	M12 = NGC 6218	TMO
U57	17.0 -04	54/56	GC	M10 = NGC 6254	TMO
U58	17.0 -30	58	GC	M62 = NGC 6266	TMO
U59	17.3 +43	52	GC	M92 = NGC 6341	TMO
U60	17.7 -32	58/69	OC	M6 = NGC 6405 = Butterfly Nebula	TMO
U61	17.8 +06	54	OC	IC 4665	HT
U62	17.9 -35	58/69	OC	M7 = NGC 6475	TMO
U63	18.1 -28	67	OC	NGC 6520	HT
U64	18.1 -24	67	BN	M8 = NGC 6523/6530 = Lagoon Nebula	TMO
U65	18.3 -16	67	BN	M17 = NGC 6618 = Omega Nebula	TMO
U66	18.5 +07	65	OC	NGC 6633	HT
U67	18.6 -24	67	GC	M22 = NGC 6656	TMO
U68	18.6 +05	65	OC	IC 4756	HT
U69	18.9 -06	65/67	OC	M11 = NGC 6705 = Wild Duck Cluster	TMO
U70	18.9 +10	65	OC	NGC 6709	HT
U71	18.9 +33	63	PN	M57 = NGC 6720 = Ring Nebula	TMO
U72	19.4 +20	64/65	OC	Cr 399 = Brocchi's Cluster	TMO/HT
U73	19.7 -14	66	PN	NGC 6818	HT
U74	19.7 +51	62	PN	NGC 6826	
U75	20.0 +23	64	PN	M27 = NGC 6853 = Dumbbell Nebula	TMO
U76	20.4 +41	62	OC	NGC 6910	TSD
U77	20.6 +07	64	GC	NGC 6934	
U78	20.6 +28	62	OC	NGC 6940	HT
U79	21.1 -11	77	PN	NGC 7009	
U80	21.5 +12	75	GC	M15 = NGC 7078	TMO
U81	21.6 -01	75/77	GC	M2 = NGC 7089	TMO
U82	21.5 +48	73	OC	M39 = NGC 7092	TMO
U83	21.9 +63	71	OC	NGC 7160	TSD
U84	22.1 +47	73	OC	NGC 7209	TSD
U85	22.3 +50	73	OC	NGC 7243	
U86	23.4 +43	72	PN	NGC 7662	
U87	23.9 +57	72	OC	NGC 7789	TCO/HT

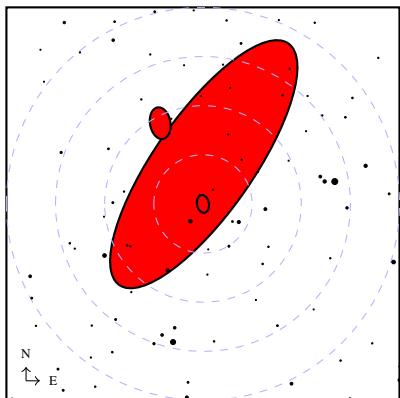
U1 = NGC 129



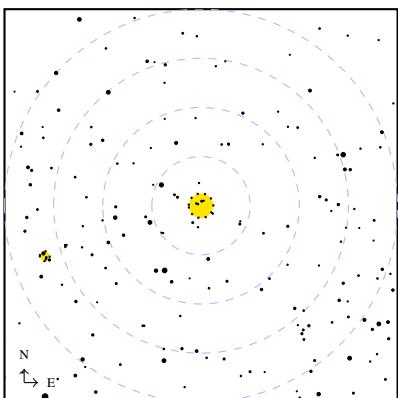
U4 = C13 = NGC 457 = Owl Cluster



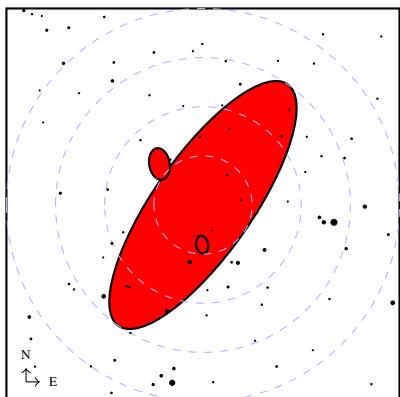
U2 = M32 = NGC 221



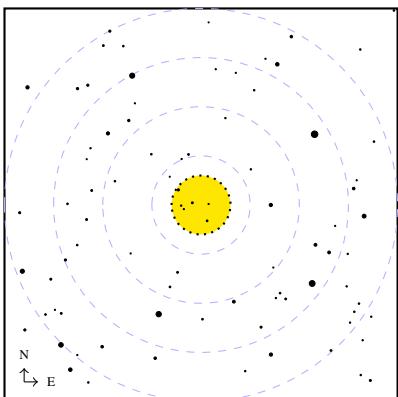
U5 = C10 = NGC 663



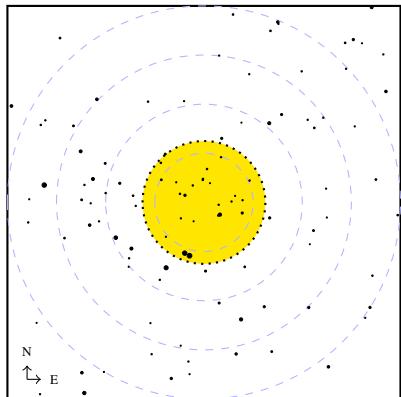
U3 = M31 = NGC 224 = Andromeda Galaxy



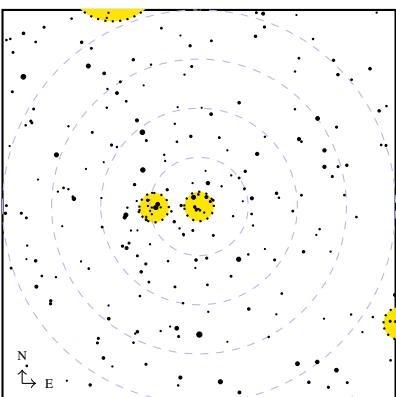
U6 = Cr 463



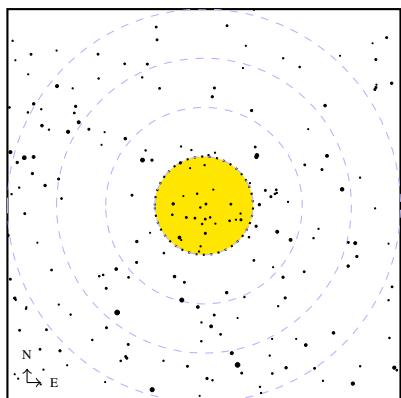
U7 = C28 = NGC 752



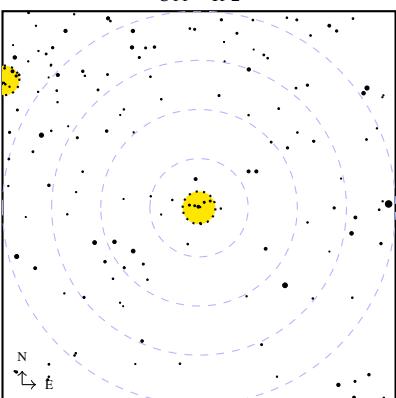
U10 = NGC 884 =  $\chi$  Persei Cluster



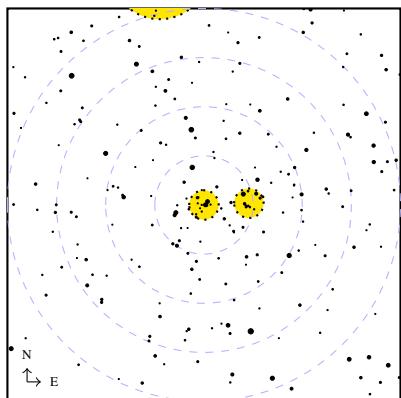
U8 = Stock 2



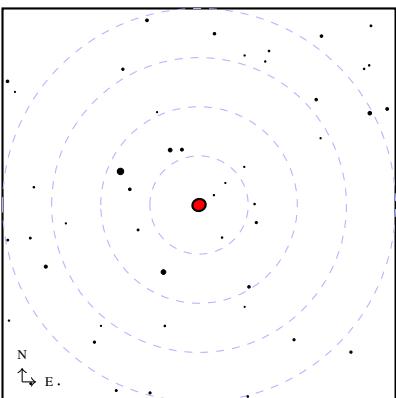
U11 = Tr 2



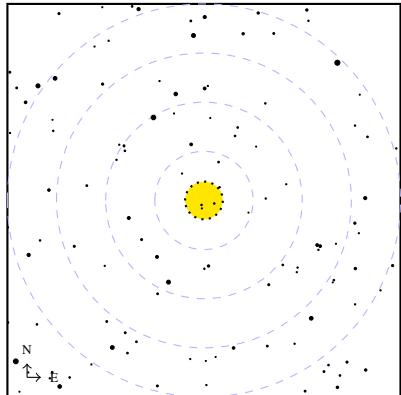
U9 = NGC 869 = h Persei Cluster



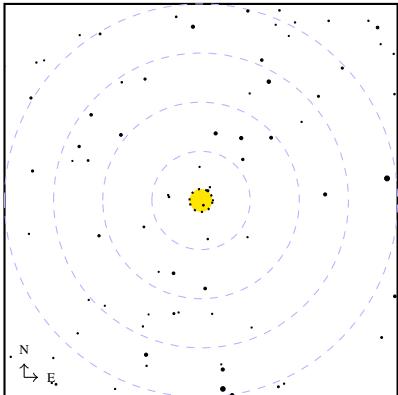
U12 = M77 = NGC 1068



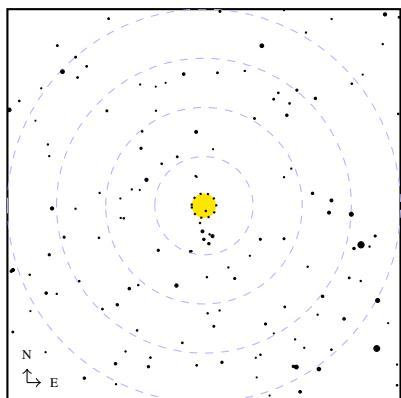
U13 = Tr 3



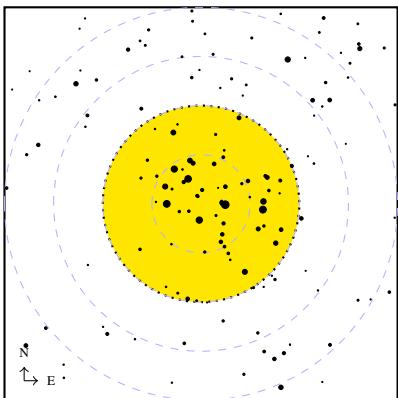
U16 = NGC 1342



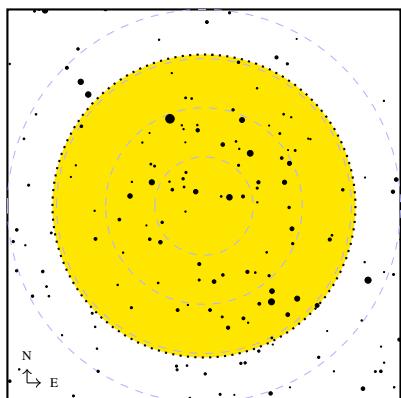
U14 = Stock 23 = Pazmino's Cluster



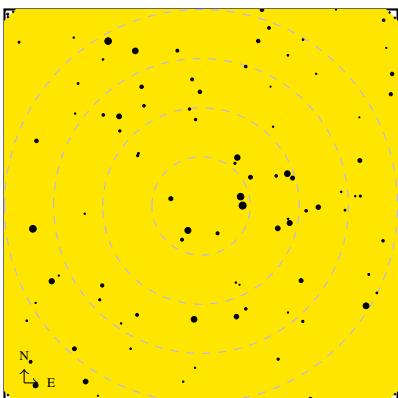
U17 = M45 = Mel 22 = Pleiades



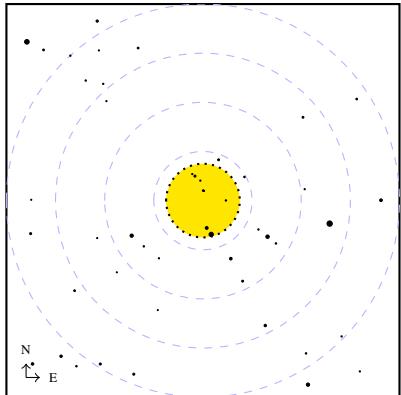
U15 = Mel 20 =  $\alpha$  Per Cluster



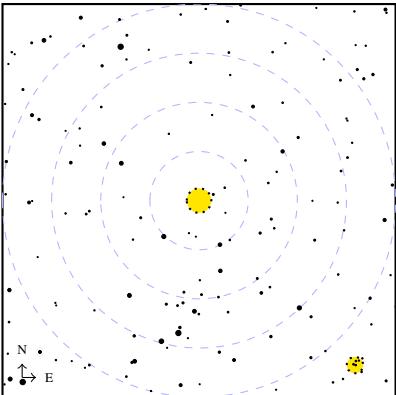
U18 = C41 = Mel 25 = Hyades



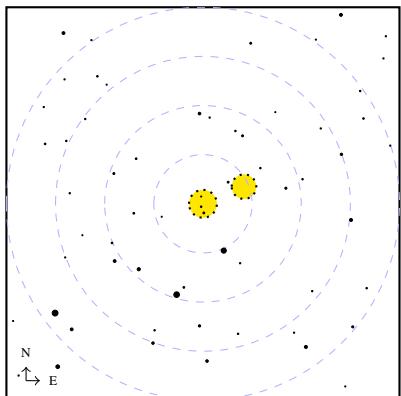
U19 = NGC 1647



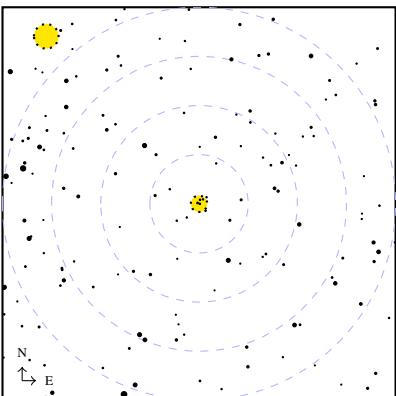
U22 = M38 = NGC 1912



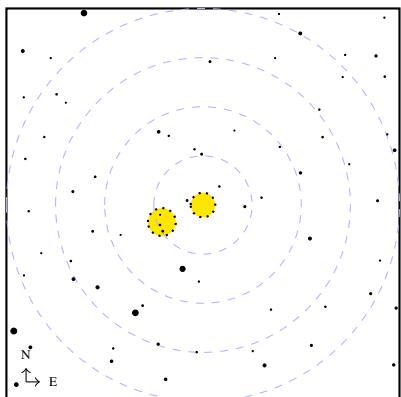
U20 = NGC 1807



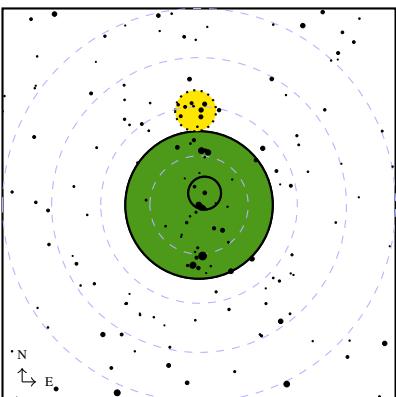
U23 = M36 = NGC 1960



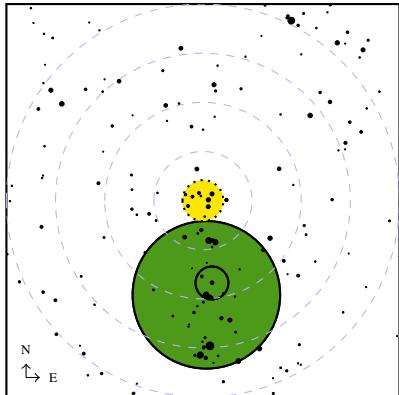
U21 = NGC 1817



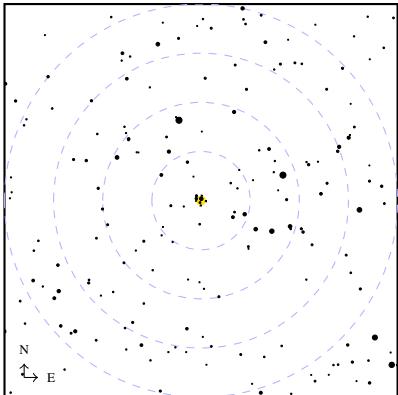
U24 = M42 = NGC 1976 = Orion Nebula



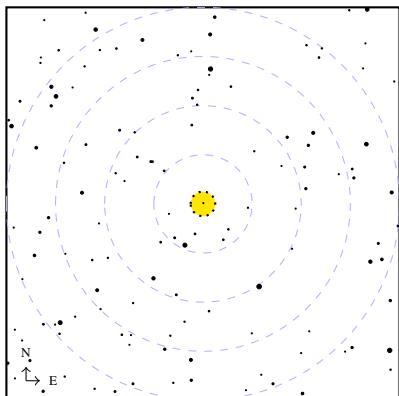
U25 = NGC 1981



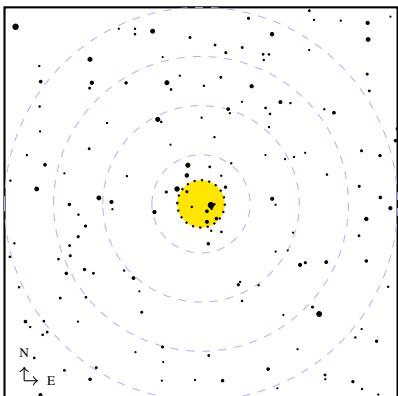
U28 = NGC 2169



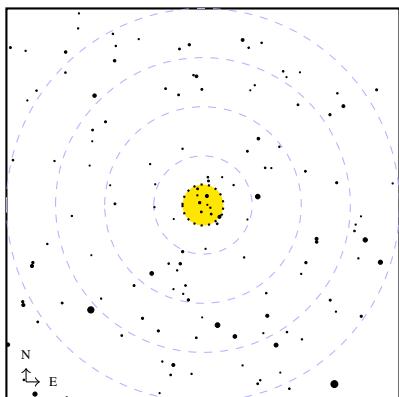
U26 = M37 = NGC 2099



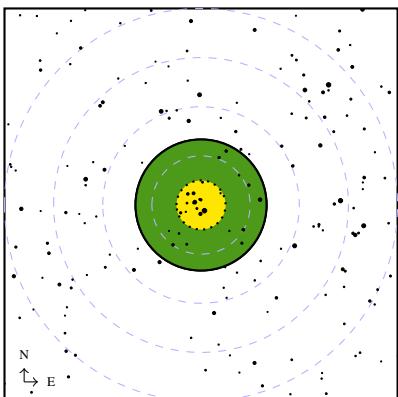
U29 = NGC 2232



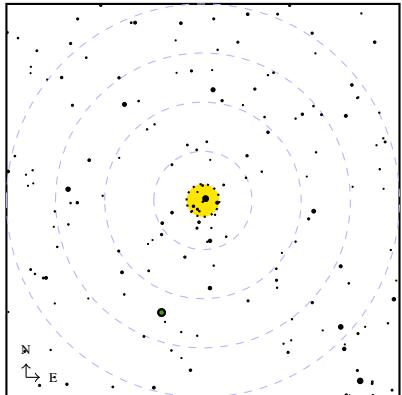
U27 = M35 = NGC 2168



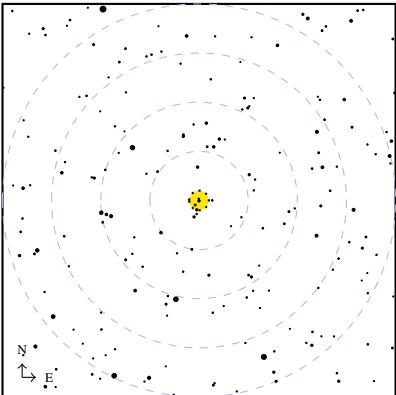
U30 = C50 = NGC 2244



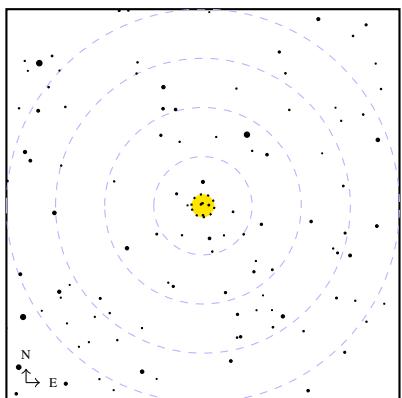
U31 = NGC 2264



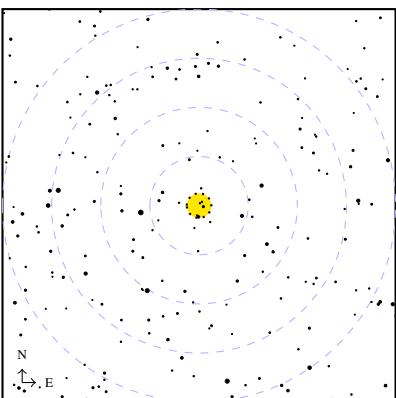
U34 = NGC 2301



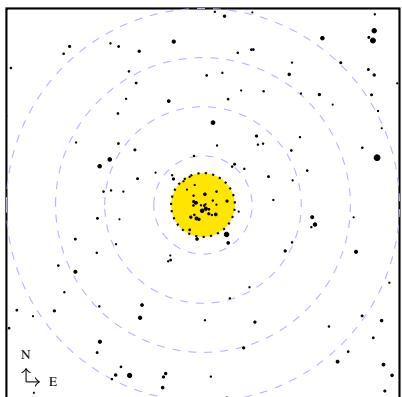
U32 = NGC 2281



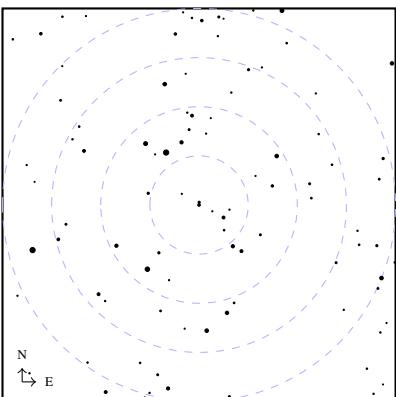
U35 = M50 = NGC 2323



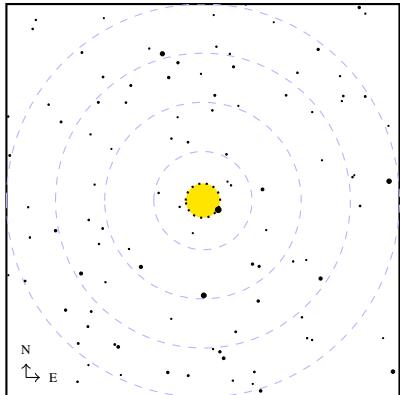
U33 = M41 = NGC 2287



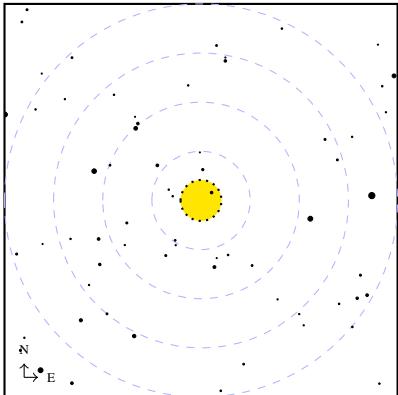
U36 = C39 = NGC 2392 = Eskimo Nebula



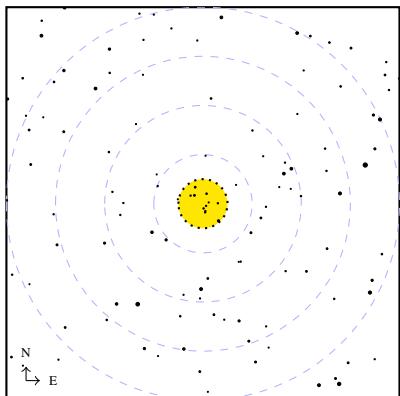
U37 = NGC 2539



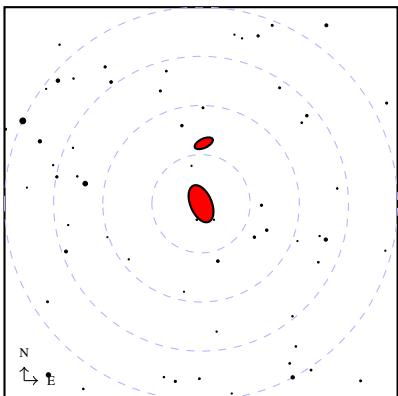
U40 = M67 = NGC 2682



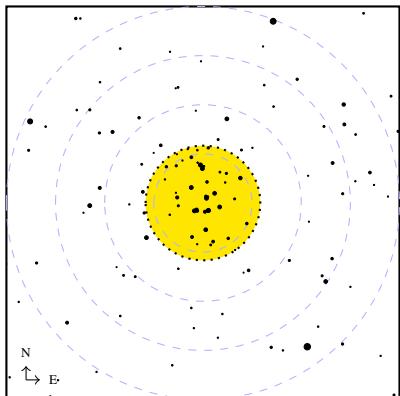
U38 = M48 = NGC 2548



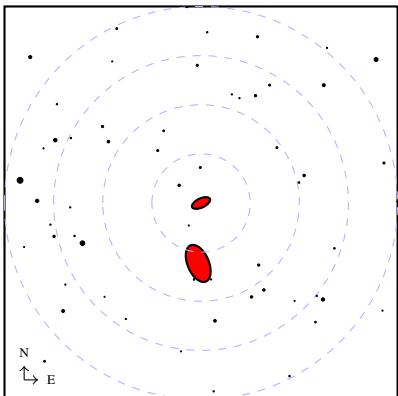
U41 = M81 = NGC 3031



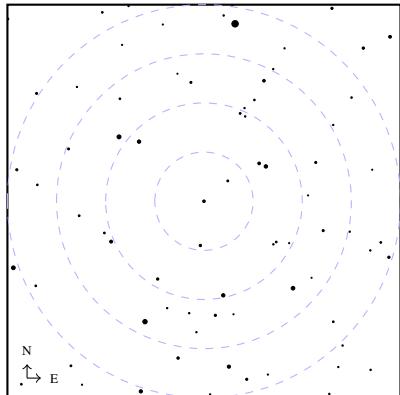
U39 = M44 = NGC 2632 = Beehive Cluster



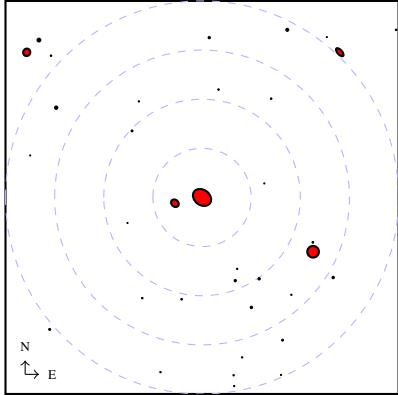
U42 = M82 = NGC 3034



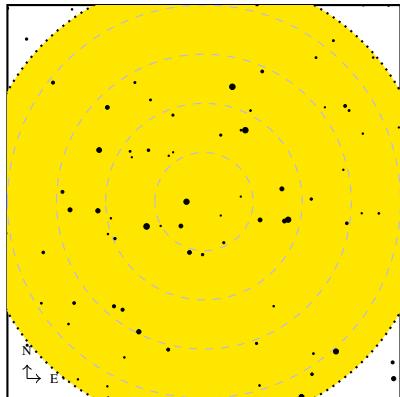
U43 = C59 = NGC 3242 = Ghost of Jupiter



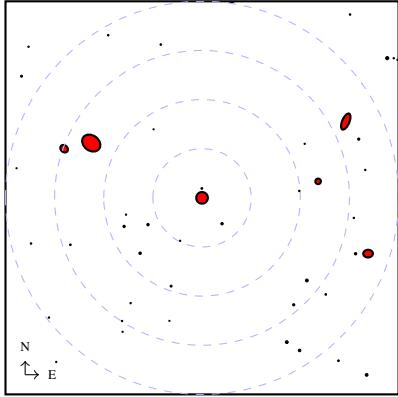
U46 = M86 = NGC 4406



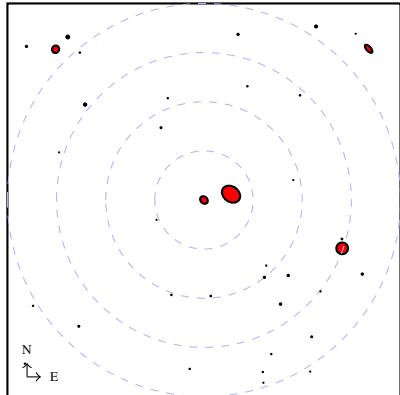
U44 = Mel 111 = Coma Star Cluster



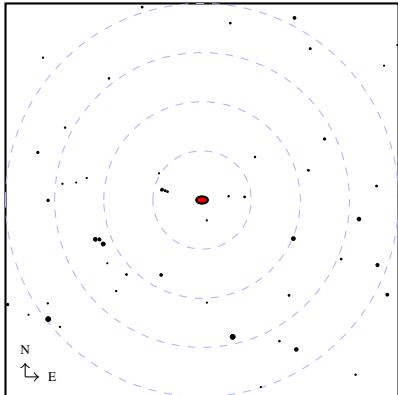
U47 = M87 = NGC 4486



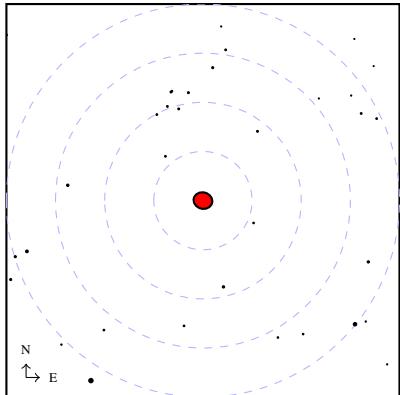
U45 = M84 = NGC 4374



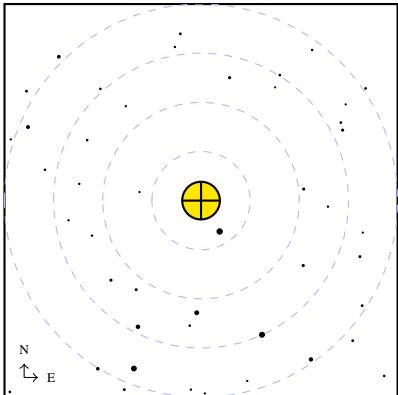
U48 = M104 = NGC 4594 = Sombrero Galaxy



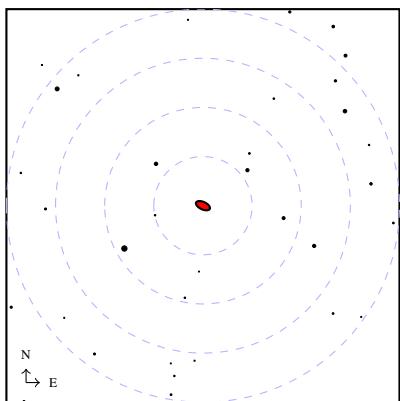
U49 = M94 = NGC 4736



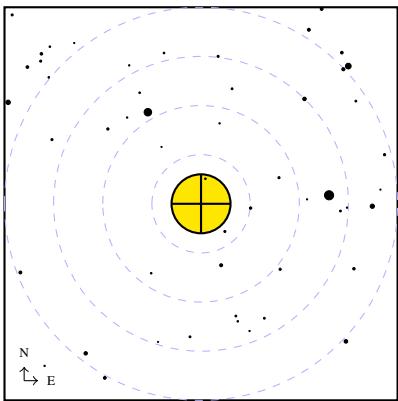
U52 = M5 = NGC 5904



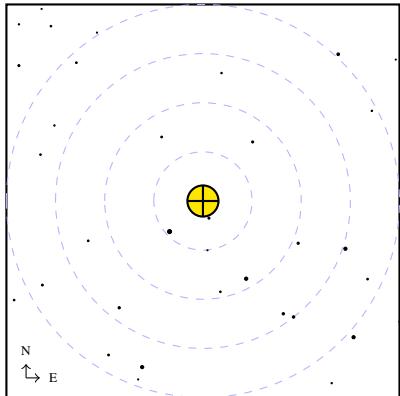
U50 = M64 = NGC 4826 = Black-Eye Galaxy



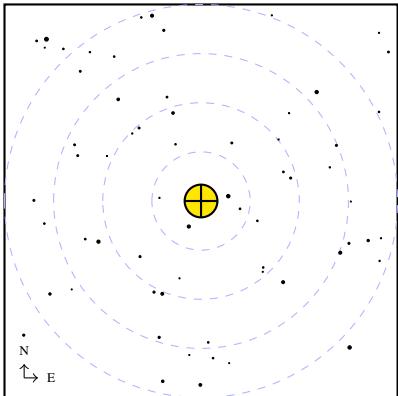
U53 = M4 = NGC 6121



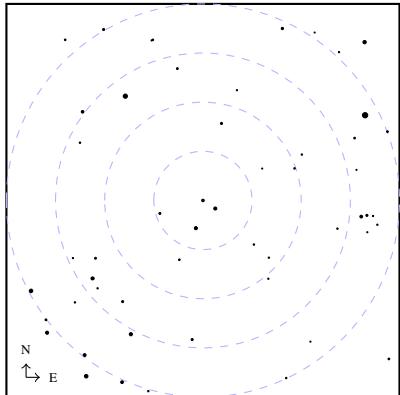
U51 = M3 = NGC 5272



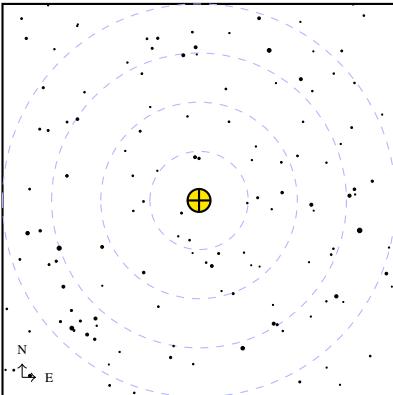
U54 = M13 = NGC 6205 = Hercules Cluster



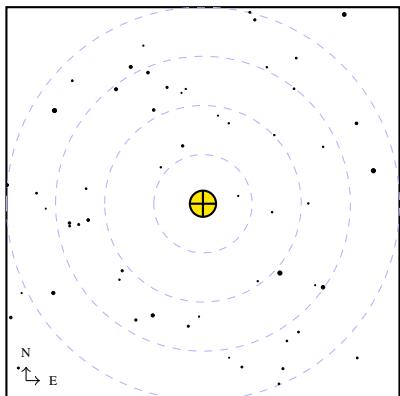
U55 = NGC 6210



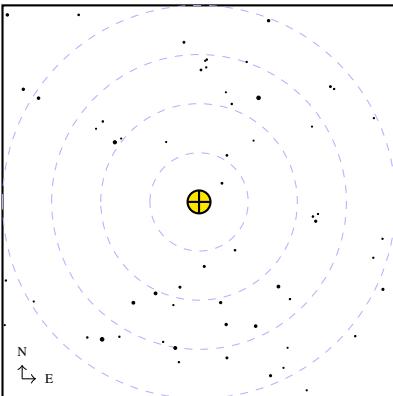
U58 = M62 = NGC 6266



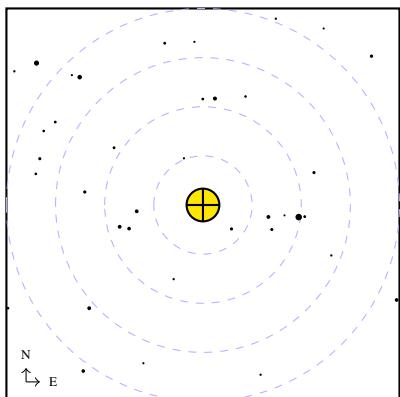
U56 = M12 = NGC 6218



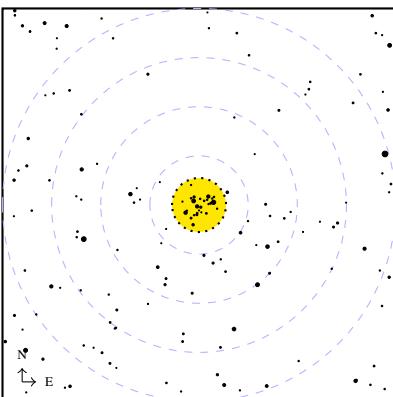
U59 = M92 = NGC 6341



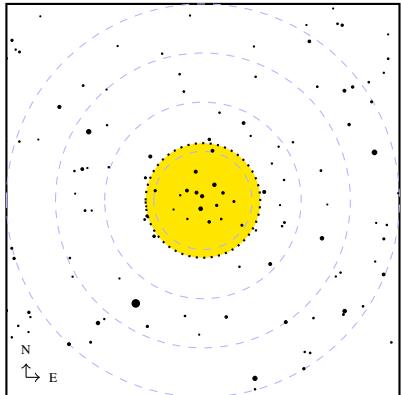
U57 = M10 = NGC 6254



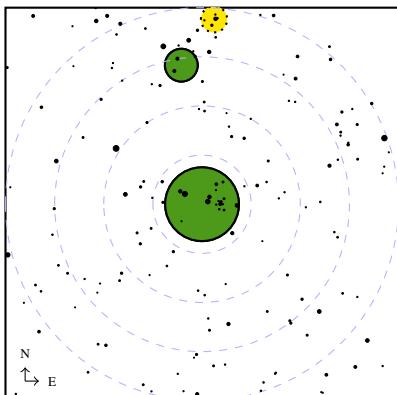
U60 = M6 = NGC 6405 = Butterfly Nebula



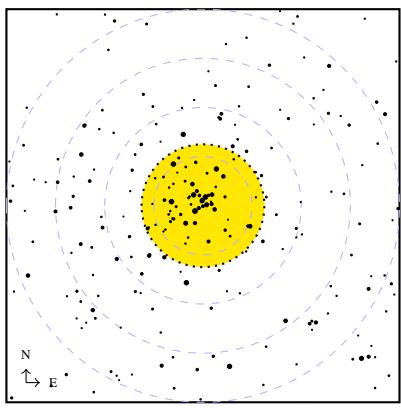
U61 = IC 4665



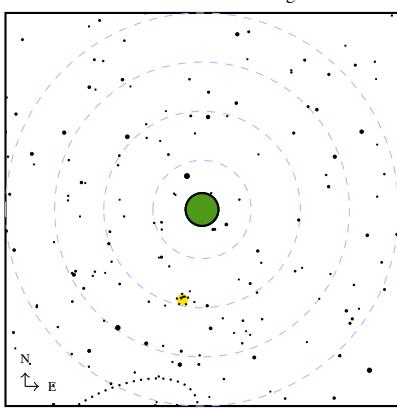
U64 = M8 = NGC 6523/6530 = Lagoon Nebula



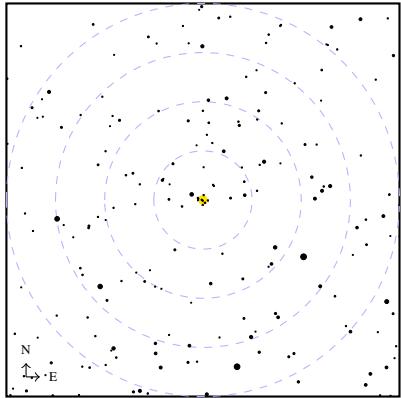
U62 = M7 = NGC 6475



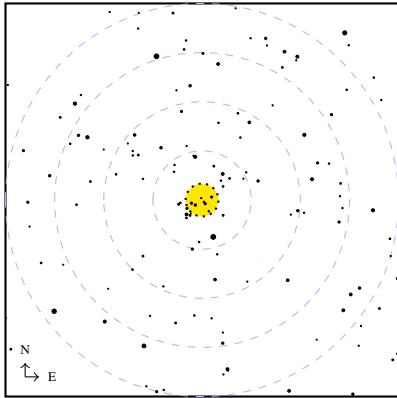
U65 = M17 = NGC 6618 = Omega Nebula



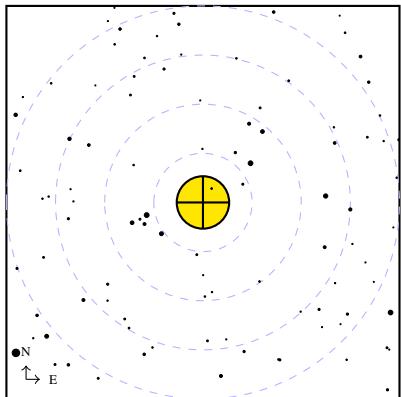
U63 = NGC 6520



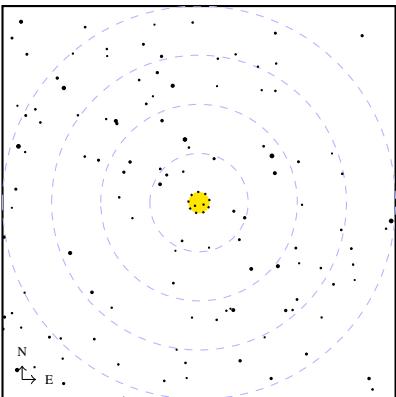
U66 = NGC 6633



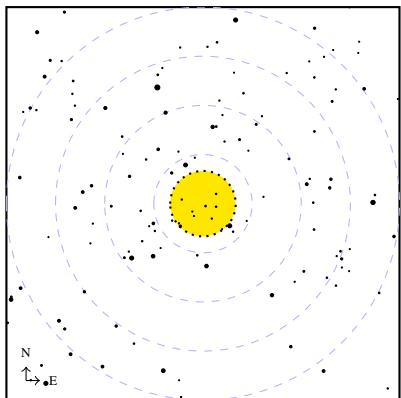
U67 = M22 = NGC 6656



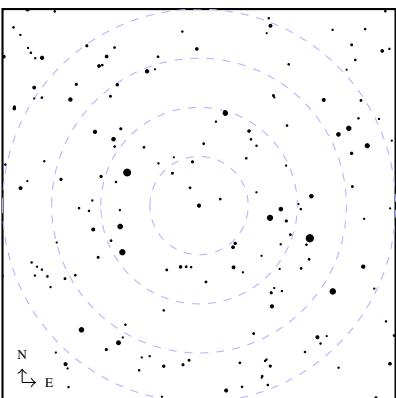
U70 = NGC 6709



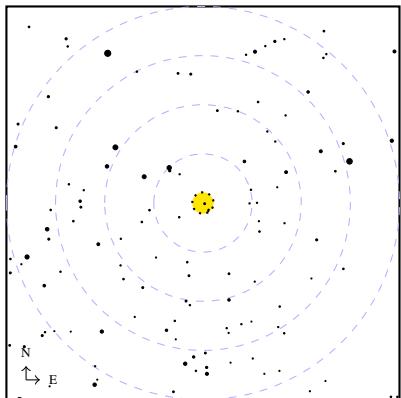
U68 = IC 4756



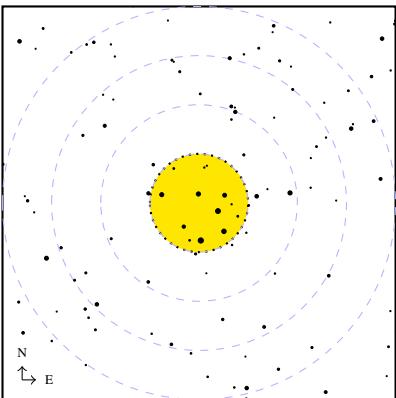
U71 = M57 = NGC 6720 = Ring Nebula



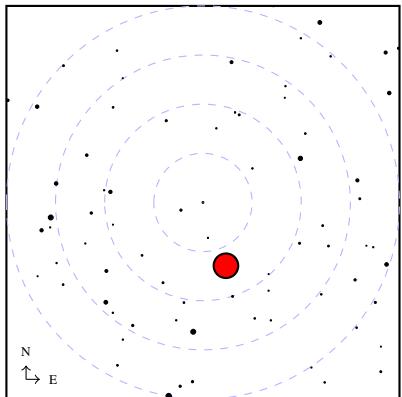
U69 = M11 = NGC 6705 = Wild Duck Cluster



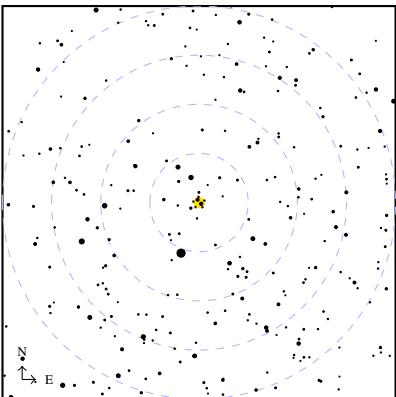
U72 = Cr 399 = Brocchi's Cluster



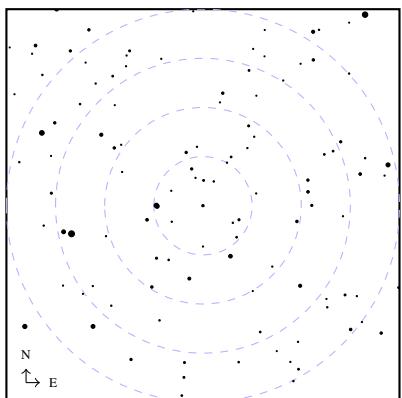
U73 = NGC 6818



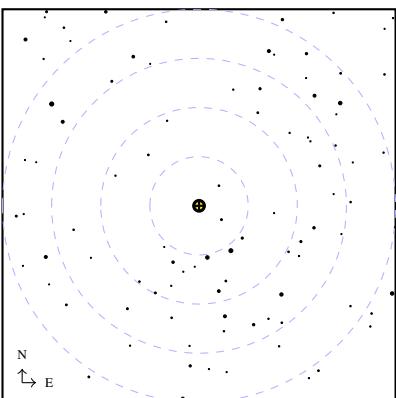
U76 = NGC 6910



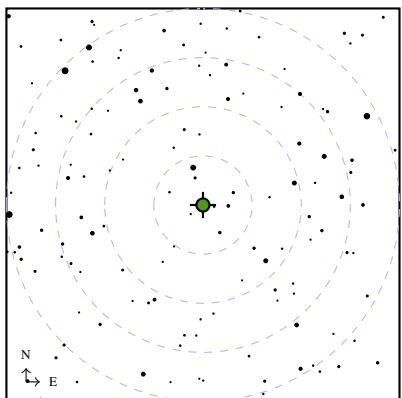
U74 = NGC 6826



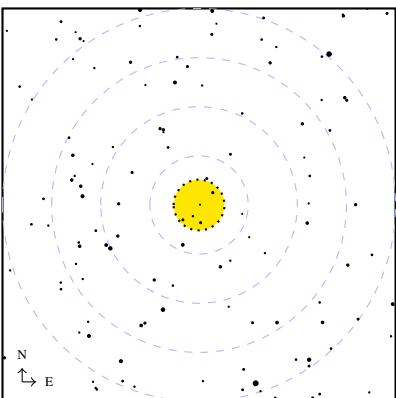
U77 = NGC 6934



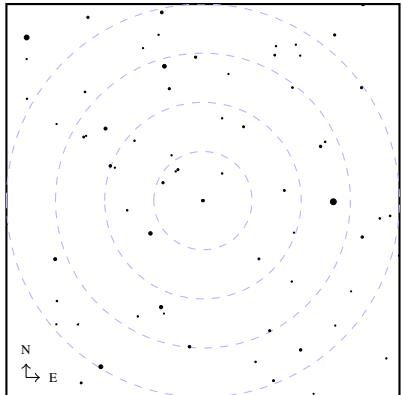
U75 = M27 = NGC 6853 = Dumbbell Nebula



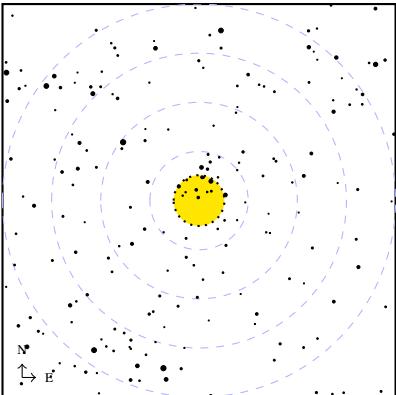
U78 = NGC 6940



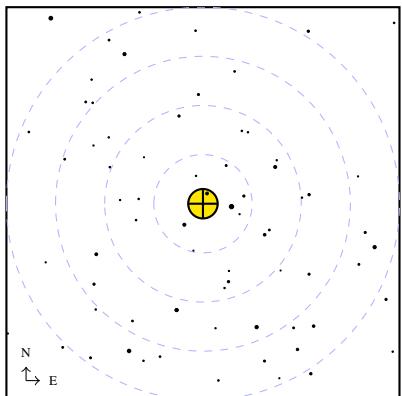
U79 = NGC 7009



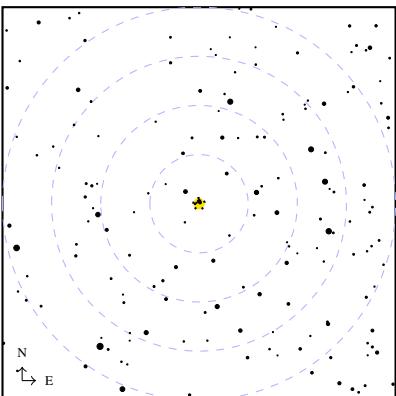
U82 = M39 = NGC 7092



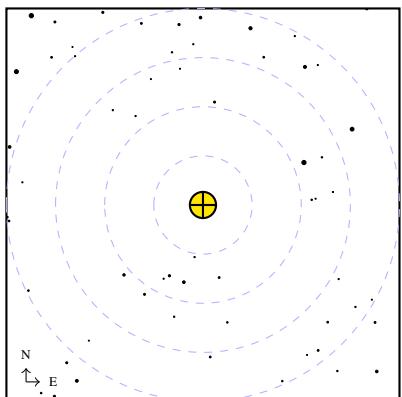
U80 = M15 = NGC 7078



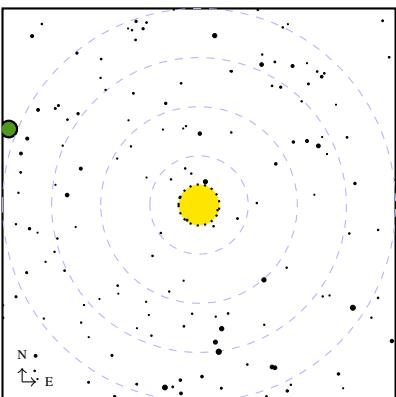
U83 = NGC 7160



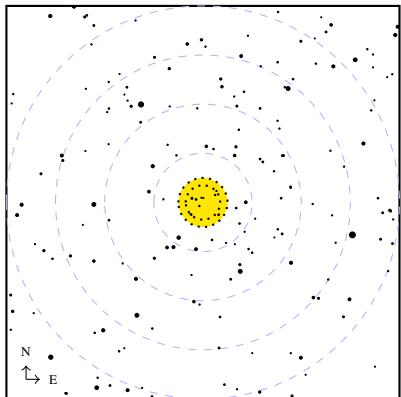
U81 = M2 = NGC 7089



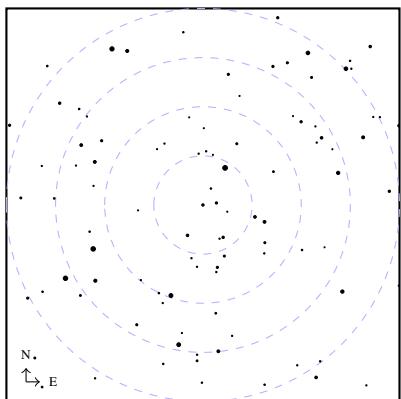
U84 = NGC 7209



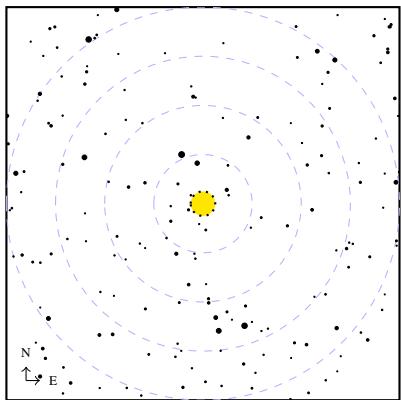
U85 = NGC 7243



U86 = NGC 7662



U87 = NGC 7789



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