

Chapter 6

Camelopardalis, the Giraffe

6.1 Overview

The northern circumpolar constellation of Camelopardalis seems to have been invented by the Dutch astronomical globe-maker Petrus Kaerius in 1613. However, it did not receive general acceptance until after it was published in 1624 in a book by the German mathematician Jakob Bartsch, a son-in-law of Johannes Kepler. Though rather substantial in area, its southeastern corner within the Milky Way, Camelopardalis has only four stars as bright as magnitude 4.5 and is not marked by any conspicuous star-patterns. However, the constellation harbors some fine open clusters, several bright, large galaxies, a nice planetary nebula, and a neat string of stars known as Kemble's Cascade.

Camelopardalis: ka-MEL-oh-pard-al-iss
Genitive: Camelopardalis, ka-MEL-oh-pard-al-iss
Abbreviation: Cam
Culmination: 9pm—Feb. 6, midnight—Dec. 23
Area: 757 square degrees
Best Deep Sky Objects: NGC 1501, NGC 1502, NGC 2403, Σ 1694
Binocular Objects: Cr464, IC 342, NGC 1502, NGC 2403, Kemble's Cascade (see NGC 1502), Stock 23

6.2 Interesting Stars

Σ 390 Double Star Spec. A2
m5.1, 9.5; Sep. 14.8"; P.A. 159° 03^h30.0^m +55°27'
Finder Chart 6-3 ★★★★★
4/6" Scopes-100x: Struve 390 is an unequal double with a white primary and a purple secondary.

Σ 485 (SZ) Double Star Spec. B0
m7.0, 7.1; Sep. 17.9"; P.A. 304° 04^h07.9^m +62°20'
Finder Chart 6-4 ★★★★★
8/10" Scopes-100x: This easy double star exhibits two equally matched components of blue-white.

1 Camelopardalis = Σ 550 Double Star Spec. B1
AB: m5.7, 6.8; Sep. 10.3"; P.A. 308° 04^h32.0^m +53°55'
Finder Chart 6-3 ★★★★★
4/6" Scopes-100x: This easy double star has a white primary and a light blue attendant.

11 – 12 Camelopardalis Double Star Spec. B3 K0
AB: m5.4, 6.5; Sep. 108.5"; P.A. 8° 05^h06.1^m +58°58'
Constellation Chart 6-1 ★★★★★
2/3" Scopes-50x: 11 and 12 Camelopardalis form a wide

pair of white and deep-yellow stars for binoculars and small telescopes at low power.

29 Camelopardalis = H IV 125 Double Star Spec. A2
m6.5, 9.5; Sep. 25.1"; P.A. 131° 05^h50.6^m +56°55'
Constellation Chart 6-1 ★★★★★
4/6" Scopes-100x: 29 Camelopardalis is an easy but unequal pair of yellow and light blue stars.

Beta (β) = 10 Camelopardalis Triple Star Spec. G0 A5
AB: m4.0, 8.6; Sep. 80.8"; P.A. 208°
BC: 11.2; Sep. 14.8"; P.A. 168° 05^h03.4^m +60°27'
Constellation Chart 6-1 ★★★★★
4/6" Scopes-75x: The AB pair is a wide, easy pair for small scopes and binoculars. At low power, this yellow and blue can be seen embedded in a streak of dark nebulosity tinting the pale Milky Way background glow.

Σ 1122 Double Star Spec. F2
m7.8, 7.8; Sep. 15.4"; P.A. 5° 07^h45.9^m +65°09'
Finder Chart 6-6 ★★★★★
2/3" Scopes-50x: Struve 1122 is an attractive pair of equally matched white stars.

Camelopardalis, The Giraffe

Constellation Chart 6-1

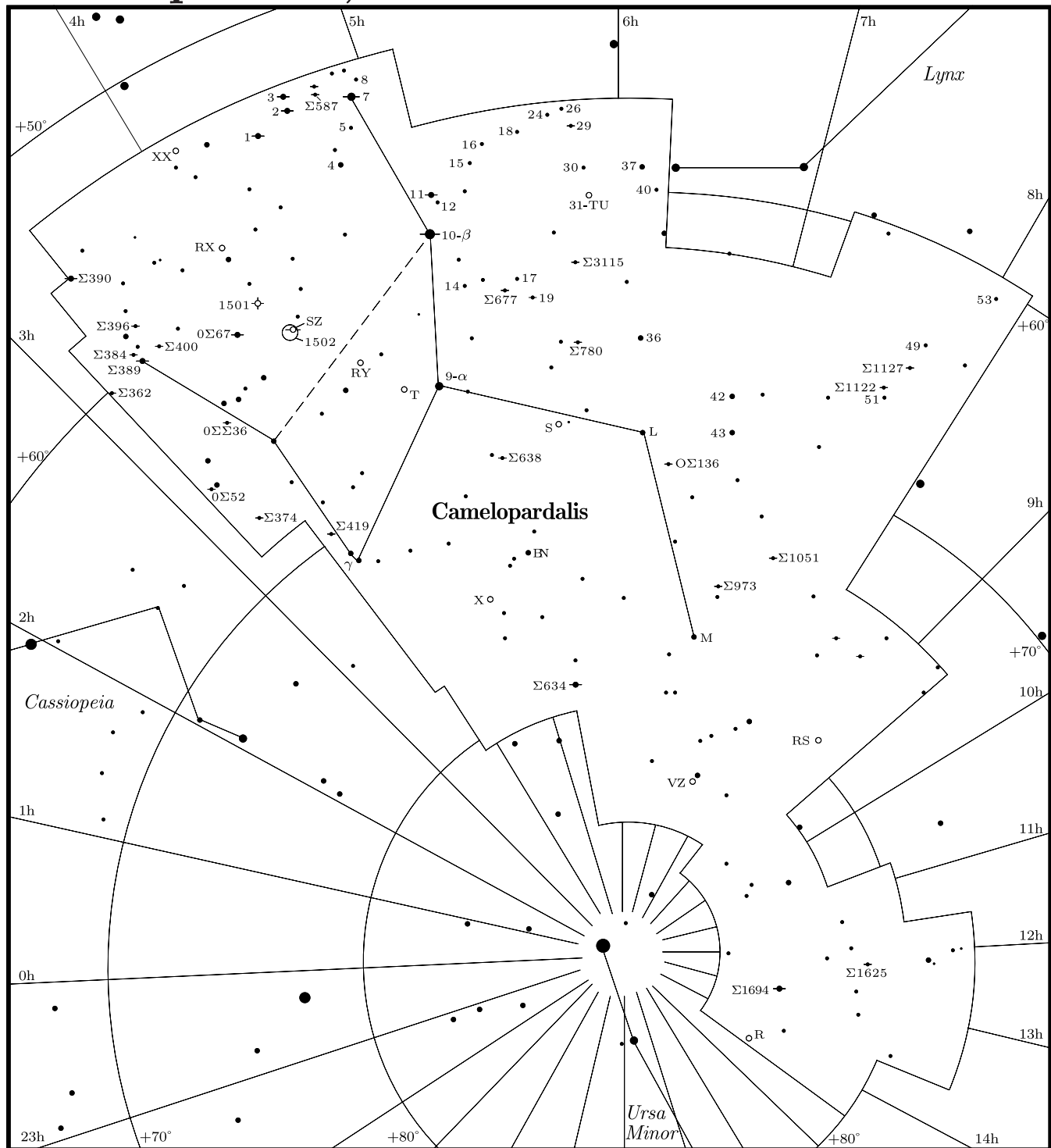


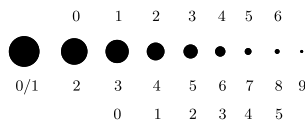
Chart Symbols

Constellation Chart

Stellar Magnitudes

Finder Charts

Master Finder Chart



→ Guide Star Pointer

•• Double Stars

Finder Chart Scale

(One degree tick marks)

○ Variable Stars

○ Open Clusters

⊕ Globular Clusters

○ Galaxies

⊕ Planetary Nebulae

□ Small Bright Nebulae

Large Bright Nebulae

Dark Nebulae

Table 6-1. Selected Variable Stars in Camelopardalis

Name	HD No.	Type	Max.	Min.	Period (Days)	F*	Spec. Type	R.A. (2000)	Dec.	Finder	Chart No. — Notes
RX Cam	11763	C δ	7.30	8.07	7.91	0.28	F6-G2	04 ^h 05.0 ^m	+58°40′	6-3	
SZ Cam		EA/DM	7.0	7.29	2.69	0.17	B0+B0	07.9	+62 20	6-4	SZ = Σ 485
T Cam	13913	M	7.3	14.4	373.20	0.47	S4-S8	40.1	+66 09	6-4	
X Cam	17446	M	7.4	14.2	143.56	0.49	K8-M8	45.7	+75 06	6-5	
S Cam	18191	SRa	7.7	11.6	327.26	0.51	C7	05 ^h 41.0 ^m	+68 48	6-5	
RS Cam	19510	SRb	7.9	9.7	88.6	0.45	M4	08 ^h 50.8 ^m	+78 58	6-7	— 6-8
R Cam		M	6.97	14.4	270.22	0.45	S2-S8	14 ^h 17.8 ^m	+83 50	6-1	

F* = The fraction of period taken up by the star's rise from min. to max. brightness, or the period spent in eclipse.

Table 6-2. Selected Double Stars in Camelopardalis

Name	ADS No.	Pair	M1	M2	Sep.*	P.A.*	Spec	R.A. (2000)	Dec	Finder	Chart No. — Notes
Σ 362	2426	AB	8.5	8.8	7.1	142	A0	03 ^h 16.3 ^m	+60°02′	6-3	AB pair both light yellow (In open cl. Stock 323)
	2426	AC		10.5	26.1	43					
	2426	AD		11.1	30.9	286					
	2426	AE		9.9	35.3	242					
O Σ 52	2436	AB	6.8	7.3	0.5	84	A2	17.5	+65 40	6-4	White — yellow pair
Σ 374	2494		7.8	9.3	10.9	295	F8	24.2	+67 27	6-4	
Σ 384	2540	AB	7.9	9.1	2.0	270	F8	28.5	+59 54	6-3	White — purple
Σ 390	2565	AB	5.1	9.5	14.8	159	A2	30.0	+55 27	6-3	
Σ 389	2563		6.5	7.5	2.8	67	A0	30.2	+59 22	6-3	
Σ 396	2592	AB	6.3	8.2	20.4	*243	A2	33.5	+58 46	6-3	
Σ 400	2612	AB	6.8	7.6	w1.6	*264	F5	35.0	+60 02	6-3	
O Σ Σ 36	2650	AB	6.8	8.6	46.1	69	F5	40.0	+63 52	6-4	
Σ 419	2678	AB	7.9	7.9	3.0	74	A3	42.8	+69 51	6-1	
A984	2678	BC		10.6	0.5	154					
O Σ 67	2867		5.3	8.5	1.9	44	K0	57.1	+61 07	6-4	AB pair blue-white White — light blue
Σ 485 (SZ)	2984	AB	7.0	7.1	17.9	304	B0	04 ^h 07.9 ^m	+62 20	6-4	
1bCam	3274	AB	5.7	6.8	10.3	308	B1	32.0	+53 55	6-3	
2 Cam	3358	ABxC	5.8	7.3	1.3	258	F0	40.0	+53 28	6-1	
Σ 587	3442	AB	7.4	8.9	21.0	185	A3	48.0	+53 07	6-1	
Σ 586			9.4	9.8	28.4	129					In field with §587 Yellow — blue
10— β Cam	3615	AB	4.0	8.6	80.8	208	G0 A5	05 ^h 03.4 ^m	+60 27	6-1	
	3615	BC		11.2	14.8	168					Binocular pair
11 — 12 Cam		AB	5.4	6.5	108.5	8	B3 K0	06.1	+58 58	6-1	
Σ 638	3759		7.6	8.6	5.2	222	K0	14.3	+69 49	6-5	
Σ 634	3864	AB	5.1	9.1	10.4	91	F8	22.6	+79 14	6-1	Yellow — light blue
Σ 677	3956		7.9	8.2	w1.2	136	G0	24.7	+63 23	6-1	
Σ 3115	4376		6.5	7.6	1.0	5	A2	49.1	+62 49	6-1	
29 Cam	4412		6.5	9.5	25.1	131	A2	50.6	+56 55	6-1	
Σ 780	4405	AB	6.8	8.1	3.8	104	F8	51.0	+65 45	6-1	
	4405	AC		10.0	12.3	150					Equal white stars
	4405	AD		13.4	19.3	56					
O Σ 136	5039		6.0	9.8	5.7	80	A2	06 ^h 28.2 ^m	+70 32	6-5	
Σ 973	5669	AB	7.1	8.1	12.6	31	G0	07 ^h 04.1 ^m	+75 14	6-7	
Σ 1051	6028	AB	7.1	9.2	1.1	284	F0	26.6	+73 05	6-7	
	6028	AC		7.8	31.5	82	F0				Both stars bluish
Σ 1122	6319		7.8	7.8	15.4	5	F2	45.9	+65 09	6-6	
Σ 1127	6336	AB	7.0	8.8	5.3	340	A2	47.0	+64 03	6-6	
	6336	AC		9.9	11.3	175					Both stars bluish
Σ 1625	8494		7.3	7.8	14.4	219	F0 F0	12 ^h 16.2 ^m	+80 08	6-1	

Footnotes: *= Year 2000, a = Near apogee, c = Closing, w = Widening. Finder Chart No: All stars listed in the tables are plotted in the large Constellation Chart, but when a star appears in a Finder Chart, this number is listed. Notes: When colors are subtle, the suffix -ish is used, e.g. bluish.

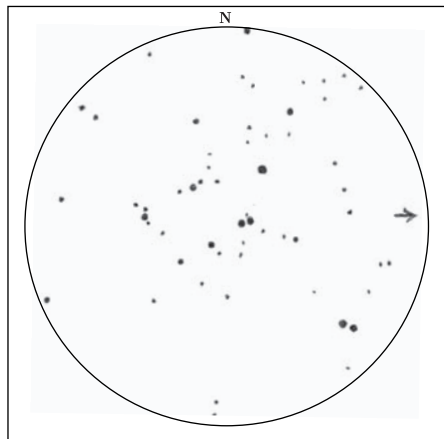


Figure 6-1. Stock 23
12.5", f4.5-70x, by G. R. Kepple

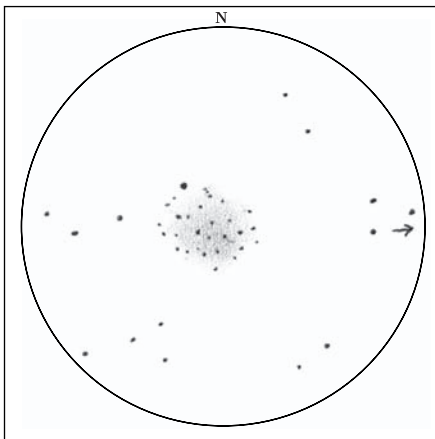


Figure 6-2. King 6
13", f5.6-100x, by Steve Coe

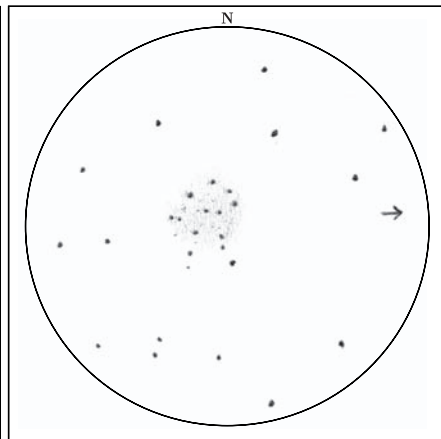


Figure 6-3. Berkeley 10
13", f5.6-100x, by Steve Coe

Σ1625 Double Star Spec. F0 F0
m7.3, 7.8; Sep. 14.4"; P.A. 219° 12^h16.2^m +80°08'
Constellation Chart 6-1 ****
2/3" *Scopes-100x*: Struve 1625 is a nearly equal pair of yellowish stars.

Σ1694 Double Star Spec. A2 A0
m5.3, 5.8; Sep. 21.6"; P.A. 326° 12^h49.2^m +83°25'
Finder Chart 6-8 ****
2/3" *Scopes-75x*: This double is an easy pair of whitish stars.
8/10" *Scopes-100x*: Subtle hues of yellow were reported for the brighter star and bluish for the fainter star, but our own observations show white stars.

6.3 Deep-Sky Objects

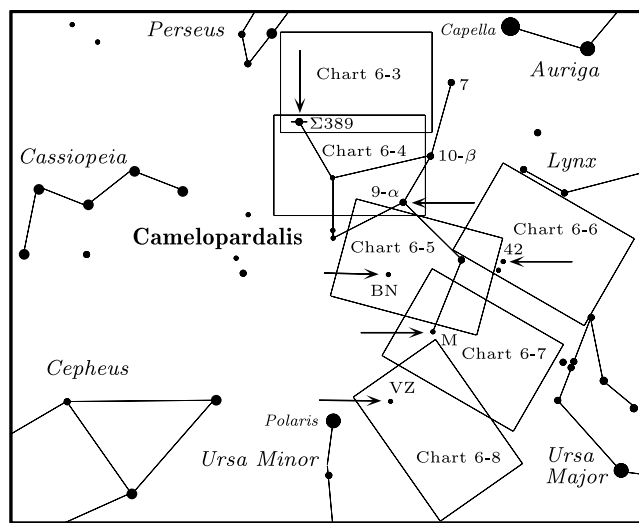
Stock 23 Open Cluster 25? Tr Type III 3 p n
ϕ 14', m5.6v 03^h16.3^m +60°02'
Finder Chart 6-3, Figure 6-1 ****

4/6" *Scopes-50x*: Stock 23 is bright and large but rather poor and not at all compressed. In its center six stars are arranged in a keystone-shaped asterism reminiscent of the Hercules Keystone. Part of the asterism keystone is Σ362, a close equal double, and a wide double of 9th magnitude stars. Located 10' west is another wide double star.

12/14" *Scopes-75x*: This cluster is bright, large, loose, and irregular with forty stars in a 10' diameter area. It contains a quadrilateral formed by four of the brightest stars, the westernmost being a double with 7.5 and 8th magnitude components 7" apart. Ten stars are concentrated near the easternmost star in the quadrilateral, eight in a NE-SW chain. Some 20 stars are around the western and southern stars of the quadrilateral, five of them forming another chain.

King 6 Open Cluster 35? Tr Type IV 2 p
ϕ 6', m -, Br? 10.0p 03^h28.1^m +56°27'
Finder Chart 6-3, Figure 6-2 ****

12/14" *Scopes-100x*: King 6 is a moderately rich and somewhat compressed cluster covering a 6' area with two dozen 10th to 13th magnitude stars standing out against a granular background.



Master Finder Chart 6-2. Camelopardalis Chart Areas
Guide stars indicated by arrows.



Figure 6-4. Reflection nebulae van den Bergh 14–15 are a challenge to detect and require very dark, transparent skies. Martin C. Germano made this 60 minute exposure on hypered Kodak 2415 Tech Pan film with an 8", f5 Newtonian reflector.

van den Bergh 14 Reflection Nebula

ϕ 20' x 8', Photo Br 3-5, Color 1-4 $03^h29.2^m +59^\circ57'$
Finder Chart 6-3, Figure 6-4 ★

16/18" Scopes-75x: Extremely faint and difficult, this nebula requires averted vision and excellent sky transparency. Because it is a reflection nebula, filters will not help you see it better. It is located SW of a 4th magnitude star extending toward a 5th magnitude star. These bright stars interfere and should be placed outside the field of view. vdB14 is a faint milky streak with many faint stars embedded in it.

van den Bergh 15 Reflection Nebula

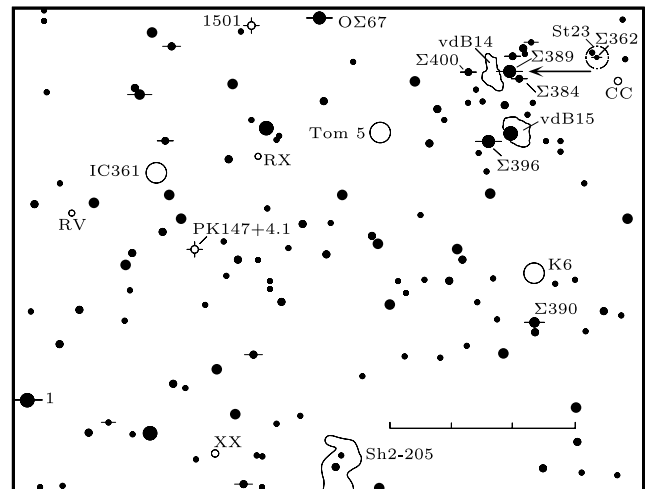
ϕ 25' x 10', Photo Br 3-5, Color 1-4 $03^h30.1^m +58^\circ54'$
Finder Chart 6-3, Figure 6-4 ★

16/18" Scopes-75x: Located 3/4° south of vdB14, this nebula surrounds a bright 5th magnitude star with its most obvious area north of the star. Even on the best of nights, vdB15 is extremely faint, requires averted vision, and can be seen only as an amorphous haze. Use Martin Germano's photo to help identify the area.

Berkeley 10 Open Cluster 50? Tr Type II 3 p

ϕ 12', m -, Br? 14.0p $03^h39.4^m +66^\circ32'$
Finder Chart 6-4, Figure 6-3 ★★

12/14" Scopes-100x: Berkeley 10 is a faint, fairly large, sparse, and uncompressed cluster of only ten stars against a faint background glow. Few more members are added at 150x.



Finder Chart 6-3. Σ 389: $03^h30.2^m +59^\circ22'$



Figure 6-5. Face-on galaxy IC 342 has a bright core surrounded by a large, faint halo with many foreground stars superimposed. Martin C. Germano made this 90 minute exposure on hypered Kodak 2415 Tech Pan film with an 8", f5 Newtonian reflector.

IC 342 U2847 Galaxy Type SAB(rs)cd I-II

ϕ 22.0' x 22.0', m8.4v, SB 15.0 03^h46.8^m +68°06'

Finder Chart 6-4, Figure 6-5

★★★

12/14" Scopes-75x: IC 342 displays a prominent nucleus surrounded by a diffuse outer halo about 12' across with many faint stars embedded in it.

16/18" Scopes-100x: This galaxy is faint with an exceptionally large 14' diameter halo around a large core and a stellar center. There are many stars

superimposed on its faint disk. SW of center is a string of six stars running NW SE and four 11th magnitude stars are visible NE of center. There is a loose clump of stars south of the halo.

Tombaugh 5 Open Cluster 60? Tr Type III 2 m

ϕ 17', m8.4v, Br? 11.62

03^h47.8^m +59°03'

Finder Chart 6-3, Figure 6-10

★★★

12/14' Scopes-100x: Standing out well in the star field, Tombaugh 5 is a fairly faint, large, loose, irregular cluster of forty 12th and 13th magnitude stars embedded in an unresolved haze. Its stars are spread evenly over a NW-SE rectangular area. A fairly bright concentration of stars is visible in the southern portion. An 8th magnitude star is located to the SW of the cluster.

NGC 1501 H53⁴ PK144+6.1 Planetary Neb. Type 3

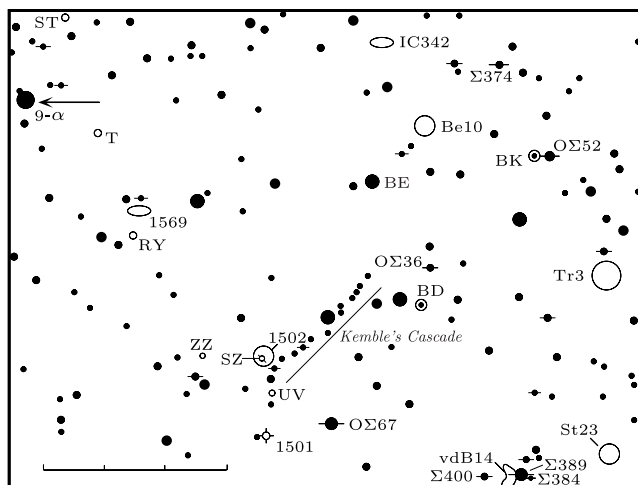
ϕ 52', m11.5v, CS 14.45

04^h07.0^m +60°55'

Finder Chart 6-4, Figure 6-6

★★★★

8/10" Scopes-100x: This planetary nebula is bright, large, and round with a light blue tint. The edges are well defined and some dark markings in the disk make it resemble the Eskimo Nebula in Gemini. The central star fades in and out at lower power but is steady with direct vision at 250x.



Finder Chart 6-4. 9-α 04^h54.1^m +66°21'



Figure 6-6. NGC 1501 is a fine bluish planetary nebula displaying a mottled disk. Martin C. Germano made this 20 minute exposure on hypered 2415 film with a 14.5" Newtonian.

12/14" *Scopes-250x*: NGC 1501 is a lovely bluish planetary nebula! It is bright with a fairly large mottled halo nearly 1' across. The periphery is diffuse but seems slightly elongated NE-SW. The center is slightly darker, its annularity being more noticeable at higher power. The prominent central star shines steadily.

NGC 1502 H47^r Open Cluster 45? Tr Type II 3 p
 ϕ 7', m5.7v, Br? 6.93 04^h07.7^m +62°20'
Finder Chart 6-4, Figure 6-7 ****

While searching for NGC 1502, you cannot help but stumble upon a beautiful 2.5° long rivulet of 8th magnitude stars immediately to the NW of NGC 1502. This asterism is known as Kemble's Cascade, a moniker given it by Walter Scott Houston. Lucien J. Kemble is the Canadian amateur astronomer for whom it is named. Kemble's Cascade is best observed in 7x or 10x binoculars.

3/4" *Scopes-50x*: This nice cluster stands out well in an interesting star field. It is bright, small, fairly rich and moderately compressed in a vague triangular shape. The triangle's southern base is the line along which lies the cluster's brightest members. At the midpoint of this base line is the cluster lucida, the conspicuous double Σ 485.

12/14" *Scopes-100x*: NGC 1502 lies near the SE end of Kemble's Cascade, a line of 8th to 10th magnitude stars with a 5th magnitude star just NW of its midpoint. NGC 1502 is bright, moderately large,

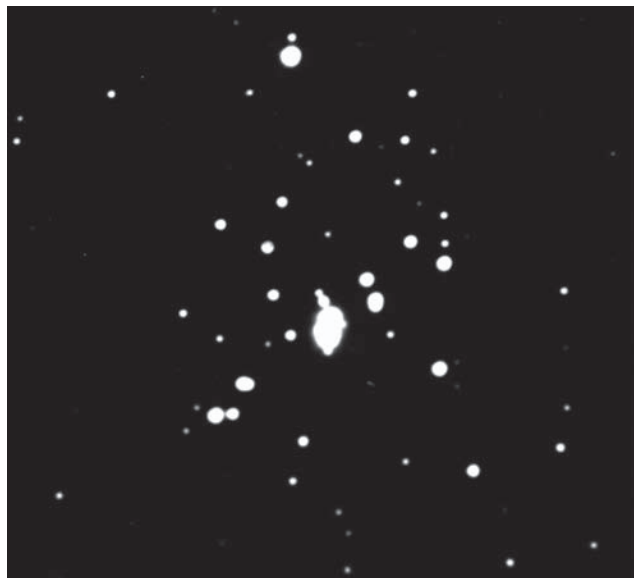


Figure 6-7. NGC 1502 is an interesting cluster containing many double stars. Don Walton made this 30 minute photo on hypered 2415 film with an 11", f10 SCT.

fairly rich and considerably compressed with some three dozen 7th magnitude and fainter stars in a 7' area. Σ 485 = ADS 2984, a wide pair of 7th magnitude stars (the B component of which is the Beta Lyrae type variable SZ Cam), lies near its center. The cluster contains half a dozen 8th and a dozen 9th magnitude stars. A nice blue and gold double star lies to the NE.

PK147+4.1 Minkowski 2-2 Planetary Nebula Type 3
 ϕ 12', m13.8v, CS - 04^h13.3^m +56°57'
Finder Chart 6-3 ***

12/14" *Scopes-200x*: This planetary nebula has a faint, small, round disk with a slight brightening at its center.

16/18" *Scopes-225x*: With a UHC filter, the disk appears fairly bright, small, and round without a central star. Without the filter, the disk is readily apparent but appears fainter.

IC 361 Open Cluster 60? Tr Type II 1 r
 ϕ 6', m11.7:v, Br? 14.55v 04^h19.0^m +58°18'
Finder Chart 6-3, Figure 6-8 ****

16/18" *Scopes-150x*: On a good night this fine but faint cluster looks like a mist of stardust! Ten 14.5 magnitude and fainter stars are irregularly scattered over a 6' area against an unresolved haze. The two brightest stars lie on the NNW side, and a string of four stars extends southward from the east side.

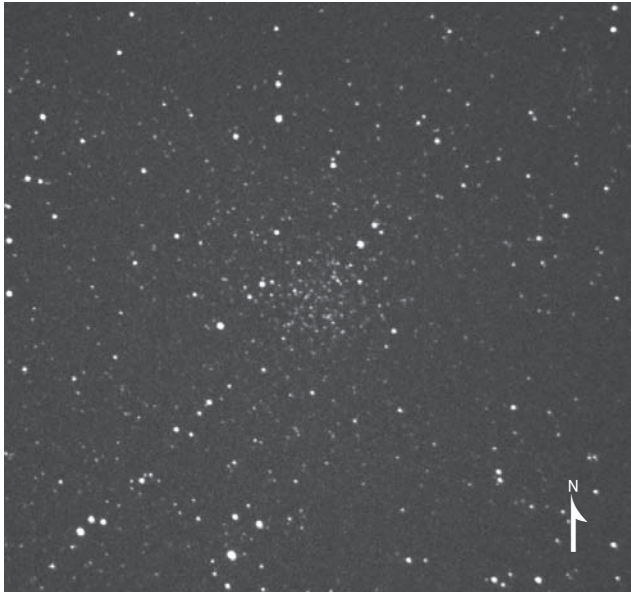


Figure 6-8. Open cluster IC 361 looks like a mist of stardust in large scopes. Lee C. Coombs made this 10 minute exposure on 103a-0 film with a 10", f5 Newtonian reflector.

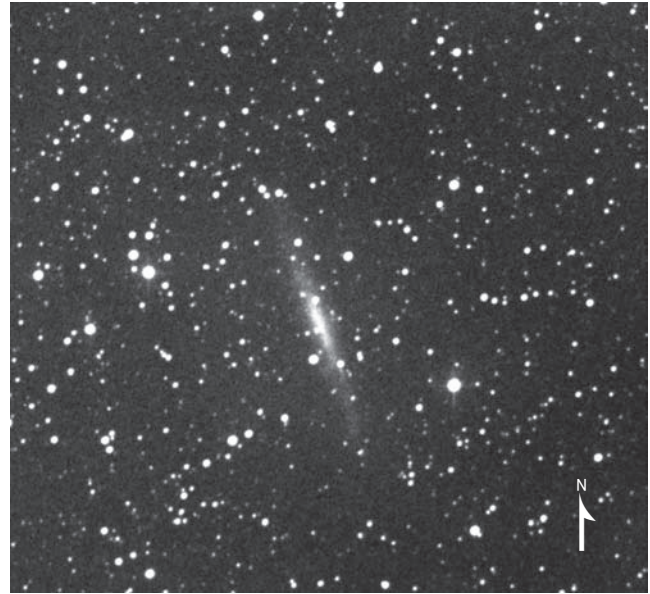


Figure 6-9. Edge-on galaxy NGC 1560 is a large ghostly streak of light in small scopes. Martin C. Germano made this 80 minute exposure on 2415 film with an 8", f5 Newtonian.

NGC 1530 U3013 Galaxy Type SB(rs)b

ϕ 4.8' $\uparrow$ 2.6', m11.4v, SB 14.0 04^h23.4^m +75°18'
Finder Chart 6-5 ★★★

12/14" *Scopes-150x*: NGC 1530 presents a faint and very diffuse halo elongated 1.5' x 0.8' NNE-SSW with a slight brightening at center.

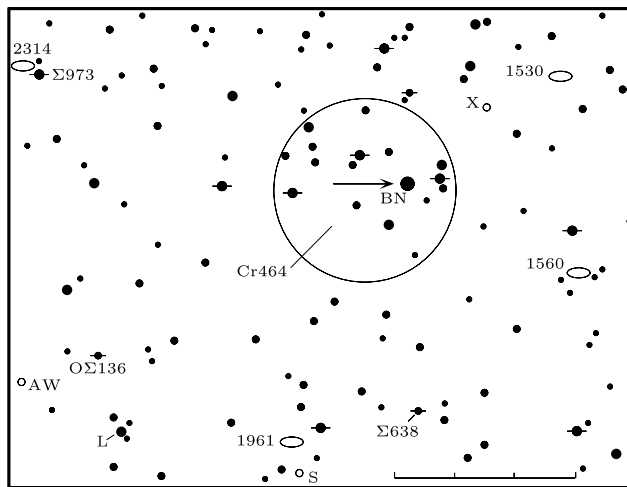
16/18" *Scopes-150x*: This faint galaxy has a tiny core containing a stellar nucleus surrounded by a uniform halo elongated 2' x 1' NNE-SSW. There is a 12th magnitude star 3' north, and, slightly nearer, are two 13th magnitude stars aligned with the galaxy's major axis.

NGC 1569 H768² Galaxy Type IBm IV-V

ϕ 3.0' x 1.9', m11.0v, SB 12.8 04^h30.8^m +64°51'
Finder Chart 6-4 ★★★

12/14" *Scopes-150x*: NGC 1569 is a nice little galaxy lying 6' NNW of a 9th magnitude star and 20' SW of a 7th magnitude star. A 10.5 magnitude star lies 1' north. The galaxy's halo is fairly bright, elongated 2' x 0.8' ESE-WNW, and the bright, extended core has a hint of mottling. A 10th magnitude star lies 1' north.

16/18" *Scopes-150x*: This galaxy is moderately bright, fairly small, and elongated 2.5' x 1' ESE WNW. The lens-shaped halo has tapered ends. The core is oval-shaped with a faint stellar nucleus. A 12th magnitude star touches the halo on the ESE edge.



Finder Chart 6-5. BN Cam: 05^h12.2^m +73°57'TM

NGC 1560 IC 2062 Galaxy Type SA(s)d

ϕ 9.2' x 1.7', m11.4v, SB 14.3 04^h32.8^m +71°53'
Finder Chart 6-5, Figure 6-9 ★★★

12/14" *Scopes-100x*: This galaxy is a very faint ghostly streak, highly elongated N-S with uniform surface brightness. 13th magnitude stars are embedded in the halo near each edge of the major axis, and a 12th magnitude star nearly touches the halo to the SE. The galaxy is flanked east and west by 10th magnitude stars, each having an 8th magnitude star lying further beyond.

16/18" *Scopes-125x*: NGC 1560 appears rather faint, large, and elongated 8' x 1.5' NNE-SSW with a large prominent core.

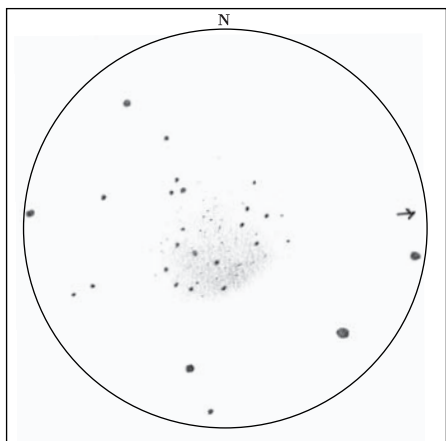


Figure 6-10. Tombaugh 5
17.5", f4.5-100x, by G. R. Kepple

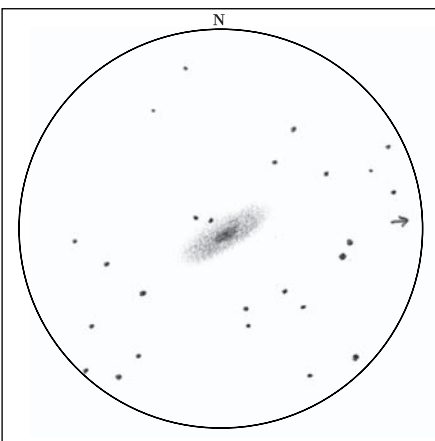


Figure 6-11. NGC 2146
13", f5.6-100x, by Steve Coe

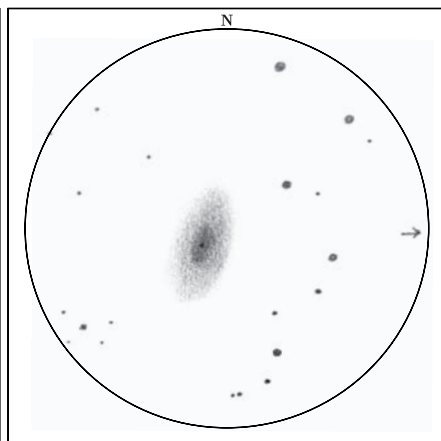


Figure 6-12. NGC 2336
8", f7-116x, by G. R. Kepple

Collinder 464 Open Cluster 50? Tr Type IV 3 p

ϕ 120', m4.2p 05^h22.0^m +73°:

Finder Chart 6-5 ★★★

15x 65 Binoculars: Collinder 464 is either an extremely large, loose, irregular cluster or merely a rich Milky Way field. It is best seen at low powers or with binoculars; resemblance to a cluster is lost with any magnification at all. The brightest star is 5th magnitude, and around it are scattered four 6th magnitude, eight 7th magnitude, and thirty-five 8th to 14th magnitude stars.

NGC 1961 H747³ Galaxy Type SAB(rs)c II

ϕ 4.3' x 3.0', m11.0v, SB 13.9 05^h42.1^m +69°23'

Finder Chart 6-5 ★★★

3/4" *Scopes-50x*: This galaxy is very faint and small, and requires averted vision.

12/14" *Scopes-125x*: NGC 1961 is a very faint galaxy, elongated 3' x 1.5' E-W with a diffuse, uniform surface brightness and a faint core. A faint star is embedded in the halo just SE of center.

16/18" *Scopes-150x*: This galaxy appears moderately bright in larger instruments, its a fairly large halo, elongated 3.5' x 1.5' E-W, slightly brightening to a small core. There is a 13th magnitude star 30" SE of the core and hints of a dark patch between the core and the star.

NGC 2146 U3429 Galaxy Type SB(s)ab pec II

ϕ 5.4' x 4.5', m10.6v, SB 13.9 06^h18.7^m +78°21'

Finder Chart 6-7, Figure 6-11 ★★★

12/14" *Scopes-125x*: NGC 2146 has a bright envelope elongated 5' x 2' ESE-WNW with a hint of spiral structure. Located to the east are half a dozen bright

stars, one of which is a close pair.

16/18" *Scopes-150x*: This moderately bright galaxy is elongated 5.5' x 2' ESE-WNW with a large faint core and a faint stellar nucleus. The halo is variegated with indistinct light and dark streaks.

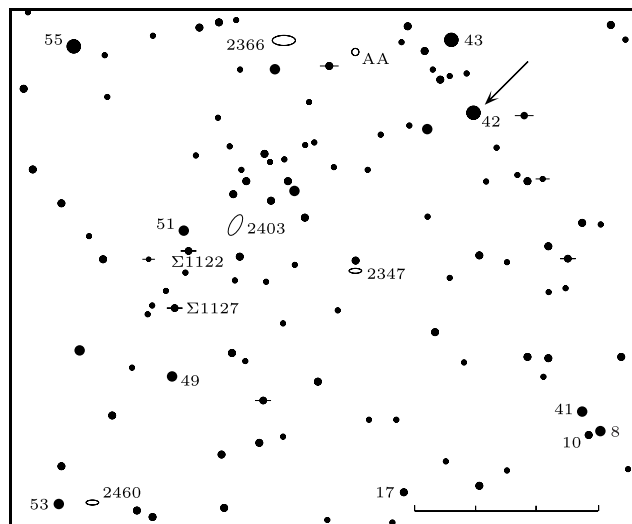
NGC 2314 Galaxy Type E3

ϕ 1.8' x 1.6', m12.2v, SB 13.2 07^h10.5^m +75°20'

Finder Chart 6-7 ★★

12/14" *Scopes-125x*: This galaxy may be found 25' east of Σ 973, a double with 7.1 and 8.2 magnitude stars 13" apart. NGC 2314 is a moderately faint, tiny round spot with a stellar nucleus.

16/18" *Scopes-150x*: NGC 2314 is visible as a faint, small, round spot only 45" across with a prominent stellar nucleus. IC 2174 lies 6' WNW.



Finder Chart 6-6. 42 Cam: 06^h50.9^m +67°34'



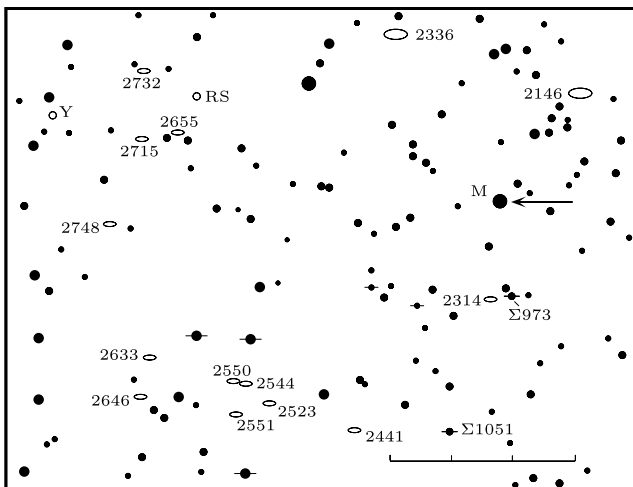
Figure 6-13. NGC 2336 displays a tiny core surrounded by a faint halo while its smaller companion, IC 467 appears as a much fainter, elongated streak. Martin C. Germano made this 75 minute exposure on hypered 2415 film with an 8", f5 Newtonian. North is up.

NGC 2268 U3653 Galaxy Type SAB(r)bc II

ϕ 3.4' x 2.2', m11.5v, SB 13.6 $07^h14.0^m +84^\circ23'$
Finder Chart 6-8 ★★★

12/14" *Scopes-125x*: NGC 2268 is a fairly faint, small, oval-shaped galaxy elongated 1.5' x 1' ENE-WSW with a slight brightening at center.

16/18" *Scopes-150x*: This galaxy is moderately faint and elongated 2' x 1.3' ENE-WSW. Its faint halo increases slightly in brightness to a large core with a faint stellar nucleus. A 13th magnitude star is at the SW edge.



Finder Chart 6-7. M Cam: $07^h00.0^m +76^\circ59'$

NGC 2347 H746³ Galaxy Type (R)SA(r)b: I-II

ϕ 1.8' x 1.4', m12.4v, SB 13.3 $07^h16.1^m +64^\circ43'$
Finder Chart 6-6 ★★

12/14" *Scopes-125x*: Located 4' south of a 7.5 magnitude star, this galaxy is a very faint, round, diffuse smudge 1' across with a faint, tiny core. On the opposite side of NGC 2347 from the magnitude 7.5 star, 13' north of the galaxy, is the faint IC 2179.

16/18" *Scopes-150x*: NGC 2347 is faint and small with a circular 1.5' diameter halo containing a faint core and a nonstellar nucleus. There is a 13th magnitude star 2' SW.

NGC 2336 U2809 Galaxy Type SAB(r)bc I

ϕ 64' x 3.3', m10.4v, SB 13.6 $07^h27.1^m +80^\circ11'$
Finder Chart 6-8, Figures 6-12–6-13 ★★★

12/14" *Scopes-125x*: This galaxy has a fairly faint halo elongated 3' x 1' N-S with a slight brightening in the middle. It forms a triangle with two stars to the west. IC 467 lies 20' SSE.

16/18" *Scopes-150x*: In larger instruments, NGC 2336 displays a small, faint core and a stellar nucleus surrounded by a diffuse halo elongated 4' x 2' N-S. There is a 15th magnitude star east of the core.

NGC 2366 H748³ Galaxy Type IB(s)m V

ϕ 8.2' x 3.3', m10.8v, SB 14.3 $07^h28.9^m +69^\circ13'$
Finder Chart 6-6 ★★★

12/14" *Scopes-125x*: This faint galaxy is located 50' north of a 5.5 magnitude star. The halo is a very faint, diffuse haze elongated 4' x 1.5' NNE-SSW with an even surface brightness.

16/18" *Scopes-150x*: NGC 2366 appears elongated 4' x 2' NNE-SSW with several areas of diffuse concentration through center, including a bright stellar knot. At the SW end, its companion, NGC 2363, is visible as a diffuse spot less than 1' across.

IC 467 Galaxy Type SAB(s)c:

ϕ 32' x 1.3', m12.6v, SB 14.0 $07^h30.0^m +79^\circ52'$
Finder Chart 6-8, Figure 6-13 ★★

16/18" *Scopes-150x*: Located 20' SSE of NGC 2336, this galaxy is much fainter and a little smaller than its companion. IC 467 appears rather faint and elongated 3' x 1' E-W with a slight brightening at the core. There is a 15th magnitude star near the west end.

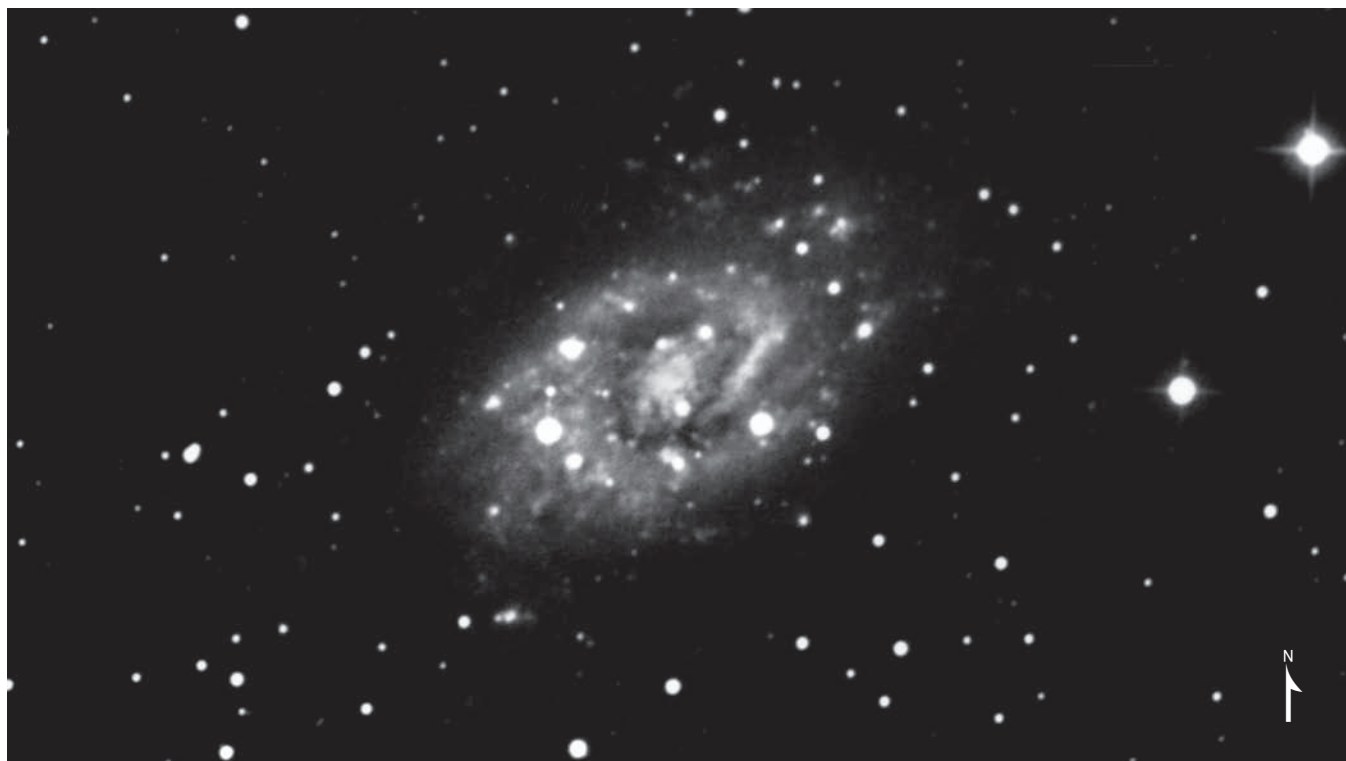


Figure 6-14. NGC 2403 displays a bright core surrounded by a tenuous halo with many stars superimposed. The halo exhibits some spiral structure in larger instruments when seeing conditions are good. Martin C. Germano made this 65 minute exposure on hypered Kodak 2415 Tech Pan film with a 14", f5 Newtonian reflector at prime focus.

NGC 2403 H44^s Galaxy Type SAB(s)cd III

ϕ 25.5' x 13.0', m8.5v, SB 14.6 07^h36.9^m +65°36'
Finder Chart 6-6, Figure 6-14 ★★★★★

NGC 2403 is an outlying member of the M81-M82 Galaxy Group. Allen Sandage used the 200" Hale telescope to detect Cepheids in it. This was the first galaxy beyond the Local Group to have Cepheid variables identified in it. Sandage derived a distance of 8,000 light years at the time! It is now believed to be about 8 million light years away.

8/10" *Scopes-100x*: This galaxy is a moderately bright 10' x 4' ovoid with a slight central brightening. It lies a little north of the 6' long E-W line between two 10th magnitude stars. Very faint stars are involved in its nebulous halo near the western 10th magnitude star. NGC 2403 may be spotted in most finders, and is easy in 10 x 50 binoculars.

12/14" *Scopes-125x*: Lovely! NGC 2403 is bright, very large, and elongated 12' x 5' ESE-WNW. The galaxy has a bright core with spiral arms attached at opposite ends. Both arms can be traced for more than a half-turn around the galaxy, their outer arcs shimmering and sparkling with a mottled texture. The northern arm is connected to NGC 2404, visible as a knot. Many faint stars are superimposed upon

the halo.

16/18" *Scopes-125x*: Impressive! This fine galaxy is bright, very large, elongated 15' x 5' ESE-WNW, and has an 11th magnitude star on each side of a slightly brighter core. The halo is tenuous with many faint stars superimposed, the brightest being just south of the core. A dark area runs between the center and the 11th magnitude star on the ESE side. Another dark streak extends north of the core.

NGC 2441 U4036 Galaxy Type SAB(r)b: II

ϕ 2.1' † 2.0', m12.2v, SB 13.6 07^h52.2^m +73°02'
Finder Chart 6-7 ★★

12/14" *Scopes-125x*: This galaxy is visible as a very faint, small, round spot with a slight brightening at center.

16/18" *Scopes-150x*: NGC 2441 is a faint, diffuse, circular 1.5' halo slightly elongated NW-SE with a slight brightening in the core area.

NGC 2460 U4097 Galaxy Type SA(s)a III

ϕ 3.7' x 2.6', m11.8v, SB 14.1 **07^h56.9^m +60°21'**
Finder Chart 6-6 **★★**

12/14" Scopes-125x: This galaxy has a prominent core surrounded by a moderately faint, diffuse 1' diameter halo slightly elongated NE-SW. A pair of 12th magnitude stars is 4.5' SE.

16/18" Scopes-150x: NGC 2460 shows a large prominent core and a stellar nucleus surrounded by a relatively faint, small halo, slightly elongated 1.2' $\dagger$ 1' NE-SW. IC 2209 lies 5.5' WSW.

NGC 2523 U4271 Galaxy Type SB(r)bc I

ϕ 2.7' x 2.0', m11.9v, SB 13.6 **08^h15.0^m +73°35'**
Finder Chart 6-7, Figure 6-15 **★★**

12/14" Scopes-125x: This galaxy shows a fairly faint circular halo 1.5' across with a slight brightening at center. There is an 11th magnitude star 1.5' SW. NGC 2523 is just a small amorphous glow in smaller telescopes.

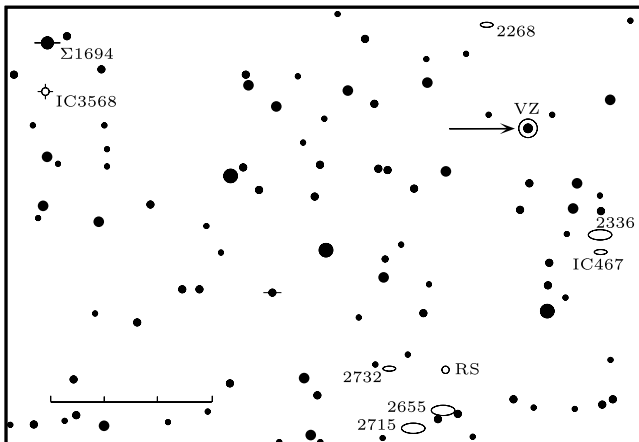
16/18" Scopes-150x: Larger instruments reveal a prominent core embedded in a distinct central bar extending NW-SE surrounded by a moderately faint 2' halo slightly elongated ENE-WSW. Companion galaxy NGC 2523B, 9' west, appears very faint, small, and round.

NGC 2544 U4312 Galaxy Type SB(s)a:

ϕ 0.9' x 0.7', m12.8v, SB 12.2 **08^h21.7^m +73°59'**
Finder Chart 6-7 **★**

12/14" Scopes-125x: This galaxy is only a faint, diffuse circular glow in a field that includes several fairly bright stars.

16/18" Scopes-150x: NGC 2544 has a very faint, round 30" diameter halo with a faint stellar nucleus.



Finder Chart 6-8. VZ Cam: 7^h31.1^m +82°25'

NGC 2550 U4359 Galaxy Type Sb:

ϕ 1.0' x 0.4', m12.8v, SB 11.7 **08^h24.6^m +74°01'**
Finder Chart 6-7 **★**

12/14" Scopes-125x: This galaxy is an extremely faint, small, elongated smudge SW of a 9th magnitude star.

16/18" Scopes-150x: The halo is faint and elongated 1' x 0.25' ESE-WNW with a slight brightening toward center.

NGC 2551 U4362 Galaxy Type SA(s)0/a

ϕ 1.6' x 1.1', m12.1v, SB 12.6 **08^h24.8^m +73°25'**
Finder Chart 6-7 **★★★**

12/14" Scopes-125x: This galaxy has a faint halo elongated 1' $\dagger$ 0.5' E-W with a slight brightening toward center. A 12th magnitude star is 2' NE.

16/18" Scopes-150x: NGC 2551 is fairly faint and elongated 1.5' x 0.8' ENE-WSW. The core is considerably brighter and contains a very faint stellar nucleus.

NGC 2633 U4574 Galaxy Type SB(s)b I-II

ϕ 2.6' x 1.6', m12.2v, SB 13.6 **08^h48.1^m +74°06'**
Finder Chart 6-7 **★★**

12/14" Scopes-125x: NGC 2633 has a small conspicuous nucleus surrounded by faint indefinite extensions. NGC 2634, 8' south, is nearly a carbon copy of NGC 2633.

16/18" Scopes-150x: This galaxy is a moderately faint, diffuse glow elongated 2' x 1' N-S with a stellar nucleus at center.

NGC 2646 U4604 Galaxy Type SB(r)0 :

ϕ 1.7' x 1.7', m12.1v, SB 13.1 **08^h50.4^m +73°28'**
Finder Chart 6-7 **★★★**

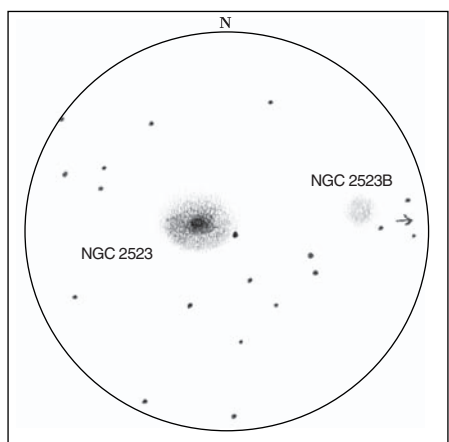
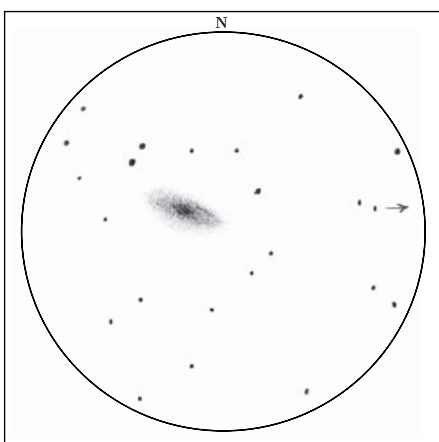
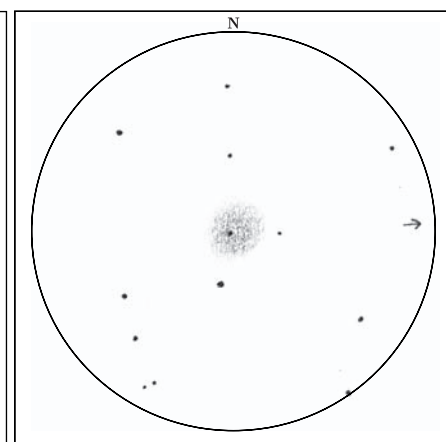
12/14" Scopes-125x: NGC 2646 has a fairly faint, round 1' diameter halo with a stellar nucleus. A faint star is near the south end and a wide, unequal double star 2' SSE.

16/18" Scopes-150x: This galaxy is fairly bright and elongated 1.3' x 1' E-W with a slight brightening to a faint stellar nucleus. IC 520 is 14' east while IC 2389 lies 11' to the WNW.

NGC 2655 H288¹ Galaxy Type SAB(s)0/a

ϕ 6.0' x 5.3', m10.1v, SB 13.7 **08^h55.6^m +78°13'**
Finder Chart 6-8 **★★★**

8/10" Scopes-100x: NGC 2655 forms an equilateral triangle with a 7.5 magnitude star to the SE and a 9th magnitude star to the NE. Its halo appears bright and elongated 3' x 2' E-W with a much

**Figure 6-15. NGC 2523B – NGC 2523***13", f5.6-100x, by Steve Coe***Figure 6-16. NGC 2748***13", f5.6-100x, by Steve Coe***Figure 6-17. IC3568***13", f5.6-300x, by Steve Coe*

brighter, extended core.

12/14" Scopes-125x: NGC 2655 has a tenuous 4' x 3' halo, somewhat brighter on the south side. The prominent core is also elongated E-W, and within it is a large nucleus.

NGC 2715 U4759 Galaxy Type SAB(rs)c II

ϕ 4.6' x 1.6', m11.2v, SB 13.2 09^h08.1^m +78°05'
Finder Chart 6-8 ★★★

12/14" Scopes-125x: NGC 2715 is a nice lens-shaped galaxy! The halo is elongated 3' x 1.5' NNE-SSW with uniform surface brightness.

16/18" Scopes-150x: Medium power reveals a moderately bright halo elongated 3.5' x 2' NNE-SSW with some mottled texture. The large, faint core contains a very faint stellar nucleus.

NGC 2732 U4818 Galaxy Type S0

ϕ 1.8' x 0.8', m11.9v, SB 12.2 09^h13.4^m +79°11'
Finder Chart 6-8 ★★★

8/10" Scopes-100x: This galaxy displays a fairly bright halo elongated 1.2' x 0.3' ENE-WSW with a bright center. A 12th magnitude star lies at the ENE tip.

12/14" Scopes-125x: NGC 2732, a fairly bright, small, edge-on galaxy, has a lenticular halo elongated 1.5' x 0.5' ENE-WSW containing a small oval core and a stellar nucleus. A 12th magnitude star is in the halo ENE of the galaxy's center. Galaxy U4832 is 4' to the east.

NGC 2748 U4825 Galaxy Type SAbc III

ϕ 2.8' x 1.1', m11.7v, SB 12.7 09^h13.7^m +76°29'
Finder Chart 6-7, Figure 6-16 ★★★

12/14" Scopes-125x: NGC 2748 is fairly bright and elongated 2' x 0.75' NE-SW with a large bright core.

16/18" Scopes-150x: This galaxy has a fairly bright halo elongated 3' x 1' NE-SW with a bulging core and a very faint stellar nucleus.

IC 3568 PK123+34.1 Planetary Nebula Type 2+2a

ϕ >6.0", m10.6v, CS 11.4 12^h32.9^m +82°33'
Finder Chart 6-8, Figure 6-17 ★★★

8/10" Scopes-175x: IC 3568 has a bright, tiny, round disk with a 13th magnitude star in contact to the west. The disk is definite at 175x but almost stellar at 100x. The planetary forms one apex of an isosceles triangle with two stars.

12/14" Scopes-250x: A beautiful bluish disk! This planetary is fairly bright but rather small and round, its central star offset to the east.

16/18" Scopes-275x: This planetary nebula is bright but fairly small even at high power. The 10" halo is round with a bright center fading to a diffuse periphery. The central star is easily visible. The 13th magnitude star on the planetary's west edge tends to merge with the disk during bad seeing conditions.

