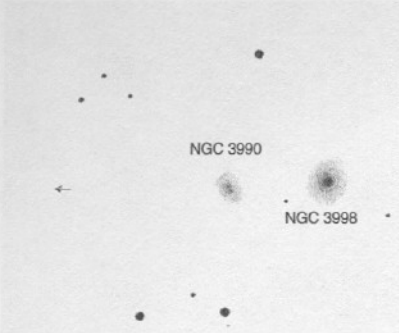


Figure 62-39. NGC 3990 and NGC 3998
8″, f4.5–150x, by Dennis E. Hoverter

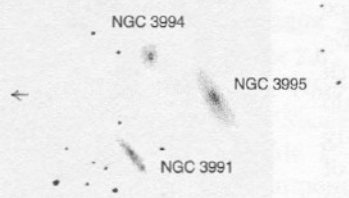


Figure 62-40. NGC 3995 Group
20″, f4.5–175x, by Richard W. Jakiel

Figure 62-41. NGC 4013
12.5″, f5–300x, by G. R. Kepple

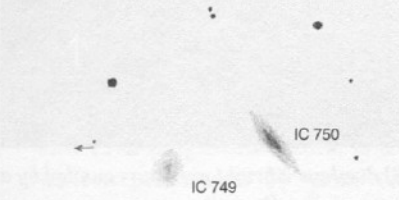


Figure 62-42. IC 749 and IC 750
18.5″, f5–275x, by Glen W. Sanner

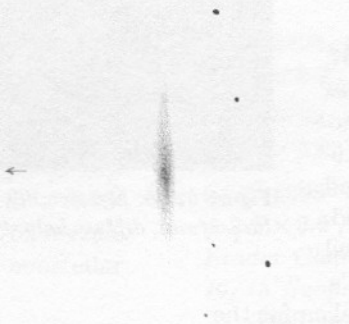


Figure 62-43. NGC 4026
20″, f4.5–175x, by Richard W. Jakiel

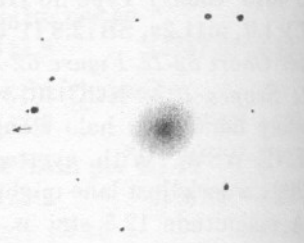


Figure 62-44. NGC 4041
17.5″, f4.5–275x, by G. R. Kepple

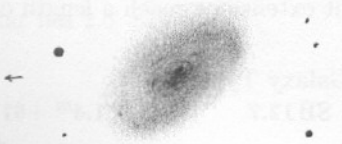


Figure 62-45. NGC 4051
13″, f5.6–165x, by Steve Coe

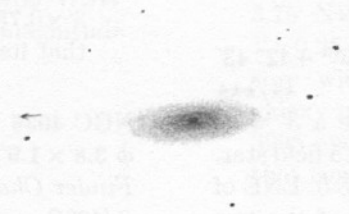


Figure 62-46. NGC 4062
17.5″, f4.5–300x, by G. R. Kepple

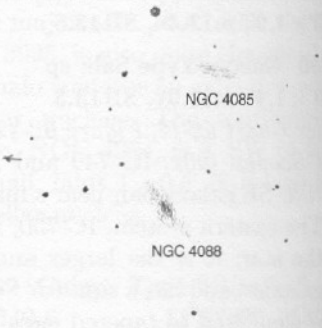


Figure 62-47. NGC 4085 and NGC 4088
13″, f5.6–165x, Steve Coe

Figure 62-48. NGC 4100
20″, f4.5–175x, by Richard W. Jakiel

Figure 62-49. NGC 4144
20″, f4.5–175x, by Richard W. Jakiel

Figure 62-50. NGC 4157
20″, f4.5–175x, by Richard W. Jakiel

16/18″Scopes–150x: The 2′ diameter halo is bright but diffuse at the edges with a slight brightening to a large core and a very faint stellar nucleus.

NGC 4047 H741[2] Galaxy Type (R)SA(rs)b: II
ϕ 1.1′×0.9′, m12.2v, SB12.0 12^{h}02.2^m +48° 38′
Finder Chart 62-12 ★★
12/14″Scopes–125x: NGC 4047 is a faint circular glow about 1.5′ in diameter and containing a fairly prominent core.

NGC 4051 H56[4] Galaxy Type SAB(rs)bc II
ϕ 5.5′×4.6′, m10.2v, SB13.5 12^{h}03.2^m +44° 32′
Finder Chart 62-12, Figure 62-45 ★★★★
8/10″Scopes–100x: NGC 4051, located 2.5′ east of an 11th magnitude star, displays a bright stellar nucleus embedded in a small core surrounded by an evenly illuminated 3′×2′ NW–SE halo.
16/18″Scopes–150x: In larger telescopes NGC 4051 has a 4.5′×3′ NW–SE halo that contains a mottled central region with a sharp stellar nucleus. Faint spiral arms can be glimpsed in the outer halo. The SW side of the halo is brighter.

NGC 4062 H174[1] Galaxy Type SA(s)c II-III
ϕ 4.4′×1.9′, m11.1v, SB13.3 12^{h}04.1^m +31° 54′
Finder Chart 62-11, Figure 62-46 ★★★★
8/10″Scopes–100x: NGC 4062 has a moderately bright 2.5′×0.75′ E–W halo containing a slightly brighter central region.
16/18″Scopes–150x: This galaxy has a highly extended 4′×1.25′ oval halo elongated toward position angle 100°. The central area is granular and grows slightly brighter to an inconspicuous nonstellar nucleus. A 14th magnitude star lies on the halo's east tip.

NGC 4085 H224[1] Galaxy Type SAB(s)c:? III-IV
ϕ 2.5′×0.8′, m12.4v, SB13.0 12^{h}05.4^m +50° 21′
Finder Chart 62-10, Figure 62-47 ★★★
8/10″Scopes–100x: NGC 4085 is the fainter and smaller of a galaxy-pair formed with NGC 4088 lying 11′ to the north. It has a moderately faint, thin 2′×0.5′ E–W halo containing a slight brightening along its major axis. The galaxy forms a triangle with two 8th magnitude stars 3′ to its SE and 3.5′ to its SW.
16/18″Scopes–150x: NGC 4085 is a 2.5′×0.5′ spindle elongated toward position angle 80°. Several bright spots are distributed along the major axis of the spindle, the brightest spot near the galaxy's center. A 12th magnitude star lies 3.5′ WNW.

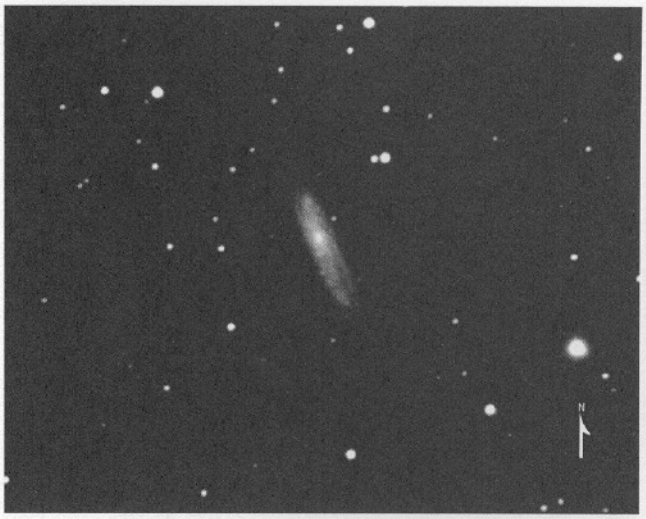


Figure 62-51. *Edge-on galaxy NGC4096 displays a bright core with a stellar nucleus surrounded by an evenly illuminated halo. Image courtesy of Bill Logan.*

NGC 4088 H206[1] Galaxy Type SAB(rs)bc II-III
ϕ 5.4′×2.1′, m10.6v, SB13.0 12^{h}05.6^m +50° 33′
Finder Chart 62-10, Figure 62-47 ★★★★
8/10″Scopes–100x: NGC 4088 is the larger and brighter member of a galaxy-pair with NGC 4085 lying 11′ to its south. The galaxy has a fairly bright 5′×2′ NE–SW halo containing a slightly brighter center.
16/18″Scopes–150x: The central area is fairly bright and cigar-shaped 4′×2′ NE–SW. The outer portion is much fainter with tapered ends reaching to 6′×2.5′.
20/22″Scopes–175x: In large telescopes NGC 4088 shows a central bar that contains a small, nearly stellar nucleus and is encircled by thick spiral arms. Several bright knots or H-II regions are just visible with careful study. The central region is mottled with small light and dark patches.

NGC 4096 H207[1] Galaxy Type SAB(rs)c II-III
ϕ 6.6′×1.6′, m10.8v, SB13.3 12^{h}06.0^m +47° 29′
Finder Chart 62-12, Figure 62-51 ★★★★
8/10″Scopes–100x: NGC 4096 is a bright 5′×1.5′ NNE–SSW streak containing a slightly brighter center with a faint stellar nucleus. An 11th magnitude star 4′ NW of the galaxy's center has a 13th magnitude companion 28″ to its east.
16/18″Scopes–150x: This galaxy contains a large conspicuous oval core with a bright nucleus embedded in an evenly illuminated, highly elongated, 6′×1.5′ NNE–SSW halo.

Figure 62-52. *Messier 40 is the wide pair of 9th magnitude stars toward the upper left corner. Galaxies NGC4284 and NGC4290 are at right above the bright star 70 Ursae Majoris. Image courtesy of Bill Logan.*

NGC 4100 H717[3] Galaxy Type (R′)SA(rs)bc I-II
ϕ 5.1′×1.8′, m11.2v, SB13.4 12^{h}06.2^m +49° 35′
Finder Chart 62-12, Figure 62-48 ★★★★
8/10″Scopes–100x: NGC 4100 is a faint, thin, uniformly illuminated sliver extending 4′×1′ NNW–SSE to tapered ends.
16/18″Scopes–150x: This fine galaxy shows a bright 5′×1.5′ NNW–SSE streak mottled with light and dark areas. Its central area is bulged and within it is a small oval core. A 12.5 magnitude star lies 7′ NNW.

NGC 4102 H225[1] Galaxy Type SAB(s)b? II
ϕ 2.9′×1.8′, m11.2v, SB12.8 12^{h}06.4^m +52° 43′
Finder Chart 62-10 ★★★
8/10″Scopes–100x: NGC 4102 is a moderately bright galaxy with a 1.5′×0.75′ NE–SW halo containing a tiny core with a stellar nucleus. A magnitude 11.5 star touches the halo's west edge, and a 12th magnitude stars lies 1.5′ ENE of the galaxy's center.
16/18″Scopes–150x: This galaxy has a well concentrated 2′×1′ NE–SW halo containing a small oval core with a stellar nucleus. 175x reveals a dark patch south of the core and a knot 25″ NE of the galaxy's center.

NGC 4144 H747[2] Galaxy Type SAB(s)cd? sp III
ϕ 6.3′×1.6′, m11.6v, SB14.0 12^{h}10.0^m +46° 27′
Finder Chart 62-12, Figure 62-49 ★★★★
8/10″Scopes–100x: NGC 4144 is a faint, uniformly illuminated 3.5′×0.75′ ESE–WNW streak.
16/18″Scopes–150x: In larger telescopes NGC 4144 has a moderately faint envelope much-elongated 5′×0.75′ in position angle 105°. The core, which extends nearly half the length of the halo's major axis, is thin and splotchy but considerably brighter than the halo. A 13th magnitude star lies just north of the galaxy's WNW tip. 2.5′ SE of the galaxy's center is a thin isosceles triangle of 13th magnitude stars that points NE at the galaxy's ESE tip.

NGC 4157 H208[1] Galaxy Type SAB(s)b? sp II
ϕ 7.1′×1.2′, m11.3v, SB13.5 12^{h}11.1^m +50° 29′
Finder Chart 62-10, Figure 62-50 ★★★★
8/10″Scopes–100x: NGC 4157, centered 5′ SSE of an 8th magnitude star, is a silvery shaft of light highly elongated 4′×0.75′ ENE–WSW and containing a bright extended core. A 10th magnitude star touching the galaxy's WSW tip is at the north corner of a 2′×1.5′ triangle with magnitude 11.5 and 12.5 stars.
16/18″Scopes–150x: In larger telescopes, NGC 4157 is a thin needle of light measuring 6′×0.75′ ENE–WSW. The center has a pronounced bulge, the ends of which taper out along the envelope. The bulge's core is off center to the SE side because of a dust lane that extends for nearly half the length of the envelope's major axis runs along its NW flank. At 175x inconspicuous light and dark areas are just visible along the dust lane's length.

NGC 4284 H798[3] Galaxy Type Sbc
ϕ 2.7′×1.2′, m13.5v, SB14.6 12^{h}20.2^m +58° 06′

NGC 4290 H805[2] Galaxy Type SAB(s)b? sp II
ϕ 2.3′×1.8′, m11.8v, SB13.2 12^{h}20.8^m +58° 06′

Messier 40 Winnecke 4 Double Star
m9.0, 9.3; Sep. 50″, P.A. 85° 12^{h}22.4^m +58° 05′
Finder Chart 62-10, Figure 62-52 ★/★★★/★★★
12/14″Scopes–125x: Messier 40, located 20′ NE of magnitude 5.5 star 70 Ursae Majoris, is merely a wide 50″ pair of 9th magnitude stars. Hevelius in the 17th century thought he saw a nebulous glow around these stars. Messier, when he checked them out, saw no nebula but included the stars in his catalogue anyway. 12′ west of M40 is the galaxy NGC 4290, a faint 2′×1′ NE–SW oval containing a faint stellar nucleus. 4.5′ west of NGC 4290 is another galaxy, NGC 4284, a very faint, circular 30″ diameter patch. NGC 4284 is at the NW corner of the 1.5′ wide equilateral triangle it forms with magnitude 12.5 and 13 stars.

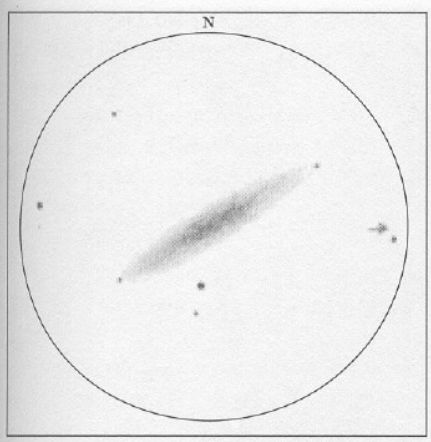


Figure 62-53. NGC 4605
17.5″, f4.5–300x, by G. R. Kepple

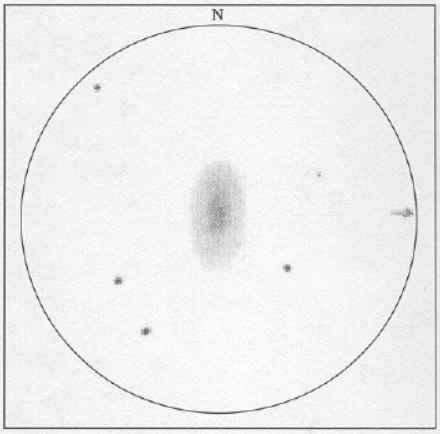


Figure 62-54. NGC 5204
12.5″, f5–250x, by G. R. Kepple

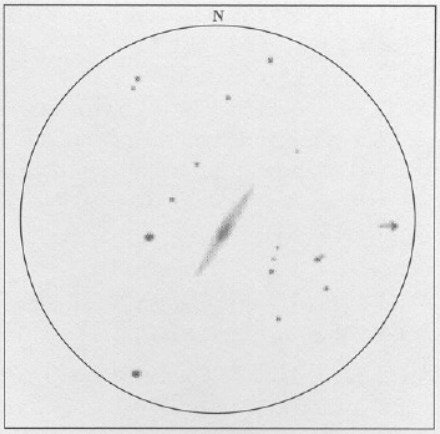


Figure 62-55. NGC 5422
12.5″, f5–250x, by G. R. Kepple

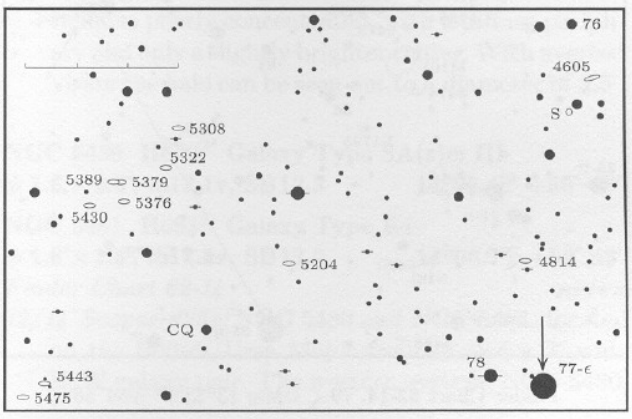
NGC 4605 H254[1] Galaxy Type SB(s) pec III-IV
ϕ 6.4′ × 2.3′, m10.3v, SB13.1 $12^h40.0^m$ +61° 37′
Finder Chart 62-13, Figure 62-53 ★★★★
8/10″Scopes–100x: NGC 4605 is a fine, bright edge-on galaxy elongated 4.5′ × 1.5′ NW–SE and containing a long, thin core.
16/18″Scopes–150x: This bright luminous streak extends 5.5′ × 2′ in position angle 125°. The 3′ long, thin core is mottled but lacks a central nucleus.

NGC 4814 H243[1] Galaxy Type SA(s)b I-II
ϕ 3.2′ × 2.3′, m12.0v, SB14.0 $12^h55.4^m$ +58° 21′
Finder Chart 62-13 ★★
12/14″Scopes–125x: NGC 4814 is a poorly concentrated, oval object elongated 2′ × 1′ NW–SE and containing a faint core with a faint stellar nucleus. A 20″ wide N–S pair of 9th and 10th magnitude stars is 11′ south.

NGC 5204 H63[4] Galaxy Type SA(s)m IV-V
ϕ 4.9′ × 3.1′, m11.3v, SB14.1 $13^h29.6^m$ +58° 25′
Finder Chart 62-13, Figure 62-54 ★★★
8/10″Scopes–100x: NGC 5204 has a faint 3.5′ × 2′ N–S halo with no central brightening.
16/18″Scopes–150x: This galaxy has a moderately faint 4′ × 2.5′ N–S halo with a slight central brightening. A 13th magnitude star lies 1.5′ SW of the halo's edge.

NGC 5308 H255[1] Galaxy Type S0
ϕ 2.6′ × 0.4′, m11.4v, SB11.3 $13^h47.0^m$ +60° 58′
Finder Chart 62-13 ★★★
8/10″Scopes–100x: NGC 5308, located 5′ north of a 9th magnitude star, has a fairly bright 2′ × 0.5′ ENE–WSW halo around a poorly concentrated center.
16/18″Scopes–150x: NGC 5308 has a bright much-elongated 2.25′ × 0.5′ ENE–WSW spindle-shaped halo containing a small oval core. A 13.5 magnitude star is 1.5′ east, and a 12th magnitude star lies 3′ north.

NGC 5322 H256[1] Galaxy Type E3-4
ϕ 6.1′ × 4.1′, m10.2v, SB13.6 $13^h49.3^m$ +60° 12′
Finder Chart 62-13 ★★★
8/10″Scopes–100x: NGC 5322 has a bright, circular 1.5′ diameter halo with diffuse edges and a stellar nucleus.
16/18″Scopes–150x: With averted vision, the halo appears to be 2.5′ in diameter and slightly elongated E–W. The central region broadly concentrates to a nonstellar nucleus. A 14th magnitude star is superimposed upon the halo just south of the core, and a second 14th magnitude star is on the halo's east edge.



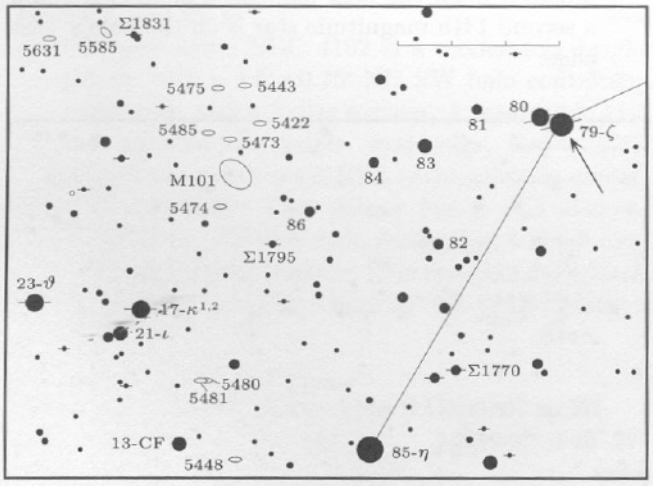
Finder Chart 62-13. 77-ε UMa: $12^h54.0^m$ +55° 58′

NGC 5376 H238[1] Galaxy Type SAB(r)b? II
ϕ 1.6′×1.0′, m12.1v, SB12.5 $13^h55.3^m$ +59° 30′
Finder Chart 62-13 ★★
12/14″Scopes–125x: NGC 5376, located 11′ west of a 9th magnitude star, is a faint, diffuse 2′×1.5′ ENE–WSW glow containing a broad, slightly brighter core with a faint stellar nucleus. Galaxy NGC 5389 lies 15′ NE.

NGC 5379 H239[1] Galaxy Type S0
ϕ 2.0′×0.8′, m12.9v, SB13.2 $13^h55.6^m$ +59° 45′

NGC 5389 H240[1] Galaxy Type SAB(r)0/a:?
ϕ 4.6′×1.2′, m12.0v, SB13.7 $13^h56.1^m$ +59° 44′
Finder Chart 62-13 ★★/★★
12/14″Scopes–125x: NGC 5389, centered 4′ SW of a 9th magnitude star, shows a prominent stellar nucleus surrounded by a faint 3′×0.75′ N–S halo. 4′ west of NGC 5389 is its companion galaxy NGC 5379, fainter and smaller, though its 1.5′×0.5′ NE–SW halo contains a much brighter center. A wide NW–SE pair of 11th magnitude stars is 5′ NNW of the galaxy-pair.

NGC 5422 H230[1] Galaxy Type S0
ϕ 3.0′×0.5′, m11.8v, SB12.1 $14^h00.7^m$ +55° 10′
Finder Chart 62-14, Figure 62-55 ★★★
12/14″Scopes–125x: NGC 5422, located 50′ NNW of Messier 101, is a faint but not difficult 2.5′×0.5′ NNW–SSE streak containing a circular core well concentrated to a stellar nucleus. This galaxy is at the WNW corner of the triangle it forms with a 10th magnitude star 2.5′ to its east and an 11th magnitude star 5.5′ to its SE.



Finder Chart 62-14. 79–ζ UMa: $13^h23.9^m$ +54° 56′

NGC 5430 H827[2] Galaxy Type SB(s)b II
ϕ 2.1′×1.5′, m11.9v, SB13.0 $14^h00.8^m$ +59° 20′
Finder Chart 62-13 ★★★
12/14″Scopes–125x: NGC 5430 has a fairly faint 2′×1′ N–S halo containing a broad circular core. A faint star is superimposed upon the halo near the core's SSE edge.

NGC 5443 H799[2] Galaxy Type S0
ϕ 2.8′×1.2′, m12.3v, SB13.4 $14^h02.2^m$ +55° 49′
Finder Chart 62-14 ★★★
12/14″Scopes–125x: NGC 5443 is at the SE corner of the triangle it forms with two 9th magnitude stars. The galaxy has an irregularly faint 2′×0.75′ NE–SW halo considerably brighter at its center. Faint stars are near both ends of the halo. Messier 101 is 90′ south.

NGC 5448 H691[2] Galaxy Type (R)SAB(r)a
ϕ 3.9′×1.9′, m11.0v, SB13.1 $14^h02.8^m$ +49° 10′
Finder Chart 62-14 ★★★
12/14″Scopes–125x: NGC 5448 is a faint, smooth 2′×0.5′ ESE–WNW streak with a long, poorly concentrated core. A 13th magnitude star lies 4.25′ south.

NGC 5457 Messier 101 Galaxy Type SAB(rs)cd I
ϕ 26.0′×26.0′, m7.9v, SB14.8 $14^h03.2^m$ +54° 21′
Finder Chart 62-14, Figure 62-56 ★★★★★

Pinwheel Galaxy

Messier 101 was discovered by Mechain in 1781, and Messier added it to his catalogue later that year. It is the largest and brightest member of a small galaxy cluster of Sc and Sd spirals and dwarf irregulars, located about 25 million light years away. Among the other members of the M101 Galaxy Group are NGCs 5585, 5574, and 5204. M101 has an absolute magnitude of −21.5, a whole magnitude brighter than our own Milky Way Galaxy. Its luminosity is 33 billion suns, and its true diameter is in excess of 190,000 light years.

8/10″Scopes–75x: Beautiful! Although moderately faint, Messier 101 is a huge galaxy displaying faint, splotchy spiral arms curving clockwise around a bright core. A 12.5 magnitude star is superimposed upon the halo 1.25′ north of the core; and a 13th magnitude star is superimposed on the halo in its NW sector. Two stars are near the halo's southern edge.

16/18″Scopes–150x: Larger telescopes show M101 to be a magnificent 20′×15′ NNE–SSW spiral galaxy with conspicuous arms of mottled texture. Several bright

Figure 62-56. *Messier 101 (NGC5457) is a beautiful object in medium and large telescopes. Under good skies a mottled halo containing a fine spiral arm structure and several H-II regions can be seen. Image courtesy Chris Schur.*

H-II regions stand out in the arms. The UHC and Deep-Sky filters increase the contrast significantly. Three isolated bright patches can be seen 8′ SW, 4.5′ ESE, and 6′ ENE of the galaxy's center, the SW patch just south of a 13th magnitude foreground star. The most prominent spiral arm springs from the SE side of the galaxy's 2′ diameter core and arcs first east and then north out of the central region: a bright knot is embedded in this arm NE of the nucleus. A fainter arm begins at the west side of the core and arcs south and SE: it contains bright knots SW and SE of the nucleus. A vague dark patch is south of the core: photos show this to be a large interarm gap. With careful scrutiny many H-II regions can be glimpsed in the galaxy's halo. Many faint foreground stars are also superimposed upon the halo.

NGC 5473 H231[1] Galaxy Type SAB(s)0:
ϕ 2.2′×1.7′, m11.4v, SB12.7 $14^h04.7^m$ +54° 54′
Finder Chart 62-14 ★★★
8/10″Scopes–100x: NGC 5473, located half a degree NNE of Messier 101, appears fairly bright and less than 1′ in diameter. It has a large core but very little surrounding halo. A 13th magnitude star lies on the galaxy's NE edge.

16/18″Scopes–150x: NGC 5473 has a diffuse, circular 1.5′ diameter halo that contains a broad, well defined core with a stellar nucleus.

NGC 5474 H214[1] Galaxy Type SA(s)cd pec IV-V
ϕ 6.0′×4.9′, m10.8v, SB14.3 $14^h05.0^m$ +53° 40′
Finder Chart 62-14 ★★
8/10″Scopes–100x: NGC 5474, located 40′ SSE of Messier 101, is a faint, diffuse 3′ diameter object with a 13th magnitude star on its NE edge.
16/18″Scopes–150x: Even in larger telescopes NGC 5474 remains poorly concentrated, with a diffuse periphery and only a slightly brighter center. With averted vision the halo can be seen out to a diameter of 3.5′.

NGC 5480 H692[2] Galaxy Type SA(s)c: III
ϕ 1.6′×0.9′, m12.1v, SB12.3 $14^h06.4^m$ +50° 43′

NGC 5481 H693[2] Galaxy Type E+
ϕ 1.8′×1.3′, m12.2v, SB13.0 $14^h06.7^m$ +50° 43′
Finder Chart 62-14 ★★/★★
12/14″Scopes–125x: NGC 5480 and NGC 5481, located on the Boötes/Ursa Major frontier, are a 3′ wide E–W galaxy pair. The western system, NGC 5480,

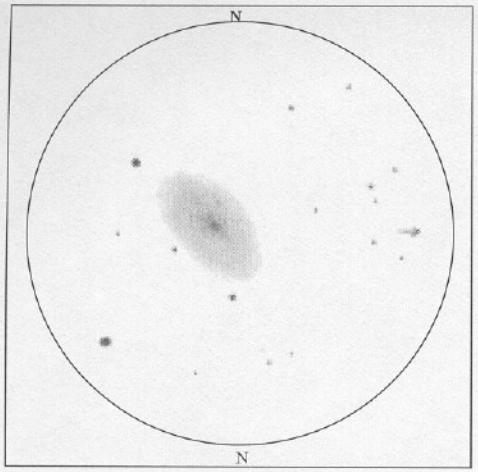


Figure 62-57. NGC 5585
12.5″, f5–250x, by G. R. Kepple

has a faint 1.5′ × 1′ N–S halo containing a stellar nucleus. The eastern galaxy, NGC 5481, is actually within Boötes. It has a brighter stellar nucleus than its companion, but its 1.25′ diameter halo appears more circular and only about as bright.

NGC 5485 H232[1] Galaxy Type SA0 pec
ϕ 2.7′ × 2.1′, m11.4v, SB13.1 $14^h07.2^m$ +55° 00′
Finder Chart 62-14 ★★★
12/14″Scopes–125x: NGC 5485, located 8′ NNE of a pair of 12th magnitude stars, has a fairly bright, circular 1.5′ diameter halo that contains a broad, prominent core with a very faint stellar nucleus. At 175x the core appears faintly mottled and the halo seems slightly elongated N–S. A 13th magnitude star is 2′ SSE of the galaxy's center. 3.5′ NW of NGC 5485 is one of its companion galaxies, NGC 5484, merely a very faint spot. 6.25′ NNE is a second companion, NGC 5486, a faint 1′ diameter glow containing a faint stellar nucleus.

NGC 5585 H235[1] Galaxy Type SAB(s)d IV-V
ϕ 5.6′ × 3.7′, m10.7v, SB13.9 $14^h19.8^m$ +56° 44′
Finder Chart 62-14, Figure 62-57 ★★★
12/14″Scopes–125x: NGC 5585, a member of the M101 Galaxy Group, is located 5′ NW of a 9th magnitude star. Its halo is a moderately faint 3.5′ × 2.5′ NNE–SSW oval that contains a slightly brighter center. A 13th magnitude star is 2′ south, a 12th magnitude star 3.5′ NE, and a 14th magnitude star 2′ east, of the galaxy's center.

NGC 5631 H236[1] Galaxy Type SA(s)0°
ϕ 1.8′ × 1.8′, m11.5v, SB12.6 $14^h26.6^m$ +56° 35′
Finder Chart 62-14 ★★★
12/14″Scopes–125x: NGC 5631 has a moderately faint, circular 1′ diameter halo that contains a bright nonstellar nucleus. The surrounding field is devoid of bright stars.