Showpiece regions in the LMC

1) Tarantula Nebula region

NGC 2070 = Tarantula Nebula (24"): at 200x unfiltered, I examined the 30 Doradus cluster = R136 cluster at the heart of the Tarantula Nebula. The cluster is dominated by R136a, a 10th magnitude bloated "star" at the center that would not focus sharply. Surrounding this star was a compact but very rich carpet of dozens of mag 14-15.5 stars packed into a 1' region that were much too numerous to count.

24": The Tarantula nebula was simply unreal at 200x in the 13mm Ethos with a UHC filter -- better than any photo I've seen and convincingly 3-dimensional, even though I viewed it late so the elevation was only 20°. Although this magnification brought out an unbelievable amount of detail in the loops and ribbons, the main complex fit snugly in the eyepiece field (30').

20": the Tarantula is the largest known emission region (800-1000 light years) and is easily visible to the naked eye from Australia. The view of the Tarantula early in the morning through a 20" f/5 at 127x (20 Nagler) and OIII filter was jaw-dropping! Near the center are several bright loops and arcs. Extending out are a number of convoluted loops including one heart-shaped arch that is quite large. Running out from the central region of the nebula are streaming lanes of nebulosity. One in particular extends quite a long distance and the outer loops and streamers seem to merge into some of the nearby HII regions forming a mind-boggling complex. There are perhaps 10 different loops and ribbons in the main body giving a 3-dimensional effect. Near the center lies an extremely compact cluster of super-luminous stars (R136) but only a few were visible including what appears to be a single bright star. Also a number of additional stars are scattered about the main body.

12": first view of the Tarantula in Les Dalrymple's 12" was early in the evening, very low in the southern sky (20° elevation) and without a filter. Even under these conditions it was a fascinating sight – fairly bright, detailed, 15' convoluted, mottled nebulosity with several striking loops or ribbons which radiate out from the central region. Sweeping in the nearby fields I ran across numerous small knots of nebulosity and small clusters.

NGC 2042 (18"): fairly large patch of stars and haze (association LH 89), ~5' in size. At least two-dozen stars are visible in an elongated group oriented SW-NE, including a few mag 10 stars over unresolved stars or haze. Two additional knots are to the NW and form an obtuse isosceles triangle with NGC 2042. The first knot is KMHK 1122 situated 5' NW, and S-L 585 at 10' NW. NGC 2042 is located just 17' NW of the center of the Tarantula Nebula.

NGC 2044 (18"): group of about a dozen stars in a 3' diameter at 171x dominated by three brighter stars in a 1' E-W string. Both the east and west "stars" in this line are actually compact clusters (eastern cluster = S-L 602) with multiple components on a HST image. Situated in the outer portion of the 30 Doradus complex 16' SW from the central core. Like NGC 2060, this stellar association (LH 90) also harbors a young SNR! The site of SNR 1987A (05 35 28, -69 16.2) lies only 5.5' SW.

NGC 2048 (14"): bright elongated glow, ~1'x0.7' E-W, surrounded by fainter nebulous haze extending 3'-4' in diameter. The emission component (LHA 120-N 154A) is cradled around the south and east side by a large, semicircular chain with mostly mag 12 stars and a total length of ~15' (association LH 87). NGC 2048 is situated in a glorious region of the LMC; extending to the southwest is NGC 2033 = LH 81, a large stellar association (the stars on the south side of the semicircular chain are likely members) and further north is NGC 2055 = LH 96, a huge rich cloud just south of the Tarantula Nebula.

NGC 2050 (18"): at 171x, appears as just a locally brighter spot containing perhaps a dozen stars over a hazy background glow (stellar association LH 93), ~2' in diameter. Embedded in the edge of an amazing 15'-20' linear stream of stars (association LH 93/94) which runs through the field from SW to NE which begins just off the south side of the tendrils of the Tarantula Nebula and heads southwest towards NGC 2050! Located 30' SW of the center of the Tarantula.

NGC 2055 (14"): roughly 120 stars are resolved in a gorgeous 15'x10' SW-NE star cloud (association LH 96) situated to the south of the Tarantula Nebula. The cloud is rich in faint stars but also includes a mag 9.6 star (HD 269820) at the southwest edge, along with a few other mag 10.5 stars. The background shows unresolved haze and perhaps nebulosity. Adding an NPB filter, there is definite nebulosity in the northeastern quadrant of the cloud. It spreads northwest and northeast, merging with the outer tendrils of the Tarantula Nebula!

Within this cloud is S-L 610 (often misidentified as NGC 2055), a small knot of four stars in a 1' region. It includes two bright "stars" (R127, V ≈ 10.5 and R128, V ≈ 10.7) at 20" separation, along with two 12th mag stars to the northwest. Both R127 and R128 are very compact clusters with R127 containing the brightest Luminous Blue Variable (LBV) in the LMC! NGC 2050 is probably a group of stars on the north side of the cloud. Roughly ~20 stars were resolved including a mag 10.6 star at the west edge and a mag 10.7 star (11" double) at the southwest edge. The central part contains several mag 12 stars. A long stream of mag 10-12 stars begins about 12' SW of the cluster and extends east-northeast for over 20', passing just south of the Tarantula Nebula.

NGC 2060 (18"): this fairly small knot of nebulosity is situated just SW of the main mass of the Tarantula nebula approximately 7' from the center. About a half-dozen mag 12-14 stars are involved (association LH 99) with a total diameter of 2'.

Studies have shown this nebula contains a compact x-ray source and a rapidly rotating pulsar, indicating NGC 2060 is a Crab-like supernova remnant in the LMC! (see the 1998 IAU Circ., 6810, 2).

NGC 2069 (18"): this is the northern outer loop of the Tarantula Nebula, which Dunlop and Herschel catalogued separately. Described as "almost, or entirely, detached from it." See observing notes for NGC 2070.

NGC 2074 (24"): this prominent HII region (LMC-N158C) and cluster (OB-association LH 101) appeared as a very bright, very large "C" shaped nebula surrounding a semi-circular chain or

crown of stars open to the SW. Two bright mag 10.4 and 11 stars oriented SW-NE (50" separation) lie on the northwest end of this crown. The northeastern luminary is a very close pair of OB-stars (TDS 3273 = 11.4/11.8 at 2") and the star at the southwest end (HD 269923) is the brightest in the cluster. On the opposite southeast end of the chain is a brighter mag 12.5 star (O3-class supergiant). A small bright knot, ~35" diameter, is superimposed on the general glow in the northeast side of the "C". At 216x at least 20 fainter stars were resolved in the chain besides the brighter stars at the ends. NGC 2074 is part of a huge complex (LMC-N158) stretching 11' SW-NE with NGC 2081, a bright HII region that lies just 8' NE. LMC-N158 is located roughly 20' SSE of the center of the Tarantula Nebula.

NGC 2081 (24"): at 214x, this is a gorgeous star cloud consisting of two dozen stars in a 5' region (stellar association LH 104 dominated by B-class supergiants), including many mag 13-14 stars as well as mag 12.2 star HD 38489 (an extreme luminous blue variable!) on the northeast side. Adding a UHC filter enhances a fairly bright HII glow that nearly surrounds the entire cluster in a triangular wreath (weak in the center)! The brightest portion is a ribbon with a bright region (identified in SIMBAD as BSDL 2722) at one end just south of the cluster and extending due east. With closer inspection BSDL 2722 actually consists of a couple of knots and fainter streaks intersecting! Just beyond the east end of this ribbon is NGC 2091, a slightly elongated cluster that is collinear with the streamer. HDE 269936, a mag 11 "star" (found to be an extremely compact cluster) is just off the SW side and NGC 2074, a bright HII region and cluster (part of the same complex LMC-N158), lies 8' SW.

NGC 2092 (18"): very faint round knot, ~40" diameter with a brighter core. Located 4' W of NGC 2100 and 17' SE of the center of the Tarantula.

NGC 2093 (14"): this stellar association (LH 109) is located just 20' NE of the center of the Tarantula Nebula and less than 1-' SSE of a mag 7.2 star (HD 38617). It appeared as a fairly bright, fairly large mottled glow, roughly 1.7' in diameter. A mag 11.7 star is at the west edge. Several faint stars are resolved around the edges, including ones at the north, northeast and south side. A mag 9.4 star (HD 38654) is 3' NW and a mag 9.4 star (HD 269975) is 6' WSW.

NGC 2100 (18"): this LMC cluster appears as a small, bright clump of stars and unresolved haze (V = 9.6) with a diameter of ~2'. Fairly compact and isolated with at least 10 mag 12 and fainter stars resolved. Located 20' ESE of the core of the Tarantula nebula within the LMC O-association LH 111. On the DSS, this appears to be a very rich open cluster or globular.

KMHK 1122 (18"): small knot of stars picked up 5' NW of NGC 2042 (which is 17' NW of the center of the Tarantula).

S-L 585 (18"): small knot of stars of haze picked up 10' NW of NGC 2042 (which is 17' NW of the center of the Tarantula). A similar patch was ~6' WSW (KMHK 1122).

S-L 639 (14"): this cluster is located just off the southeast side of the Tarantula Nebula. It appeared as a small high surface brightness knot, 20" diameter, with three stars resolved (one a close double). A mag 11 star is 1.2' WNW. I didn't try using a NPB filter, but the outer fringes of the Tarantula Nebula probably encompass the cluster.

2) Quadrant Arc

The "Quadrant" (of a circle) is a unique feature of the LMC -- an arching collection of associations (LH 65, 77 and 84), extending roughly 40' E-W and 15' N-S, bowed out to the south. It is sometimes incorrectly referred to as Shapley's "Constellation III", though that name applies to the NGC 1955/1968/1974 complex -- also known as the "Sextant". This group of associations is nearly centered with a huge supergiant loop HII region complex designated as LMC 4. In the interior is a gorgeous HII complex called the "Eighth-Note Nebula (N55), which was missed by Herschel. The Quadrant Arc region is visible in binoculars as an elongated glow (seen in 10x30's). The following clusters are within this region:

NGC 2002 (24"): at 200x this cluster is extremely bright but small. It is sharply concentrated with a small, brilliant core surrounded by a much fainter 30" halo. At 346x, the core diameter is ~15" diameter and three interior stars are resolved, the brightest on the SE side. Sharing the same field 8' SE is the double cluster NGC 2006 and S-L 538. NGC 2002 is within the OB association LH 65, at the west end of a huge, arcing string of associations (bowed to the south) referred to as LH 77 or the "Quadrant", which extends nearly 40' to the east beyond NGC 2041.

NGC 2006/S-L 538 (24"): NGC 2006 forms the southern member of a close pair of small clusters (a double cluster!) with SL-538 less than 1' N. At 346x it appeared fairly bright, fairly small, ~30" diameter, brighter core, with no evident resolution. Forms a small triangle with two stars on the east side. Located 8' SE of NGC 2002. Just 0.9' N is SL-538, a small, moderately bright glow that was sandwiched between a brighter star at the east edge and a fainter star off the west side. At 346x the shape appeared irregular and ~25" diameter.

NGC 2027 (13"): at the west end of an interesting, elongated cluster or association (NGC 2034 = LH 84) extending ~4'x2' E-W in a crescent shape. At 105x, this condensed portion of the cloud contains a couple of dozen mag 12-13 star and a wide pair of mag 10 stars on the NW side.

NGC 2034 (13"): at 105x this is an interesting, elongated cluster or association (LH 84), situated NW of the compact cluster NGC 2041 and at the east end of a very large cloud of stars, known as the "Quadrant", looping 30' W to NGC 2002 and including the OB associations LH 77 and LH 84. This condensed portion of LH 84 contains a couple of dozen mag 12-13 star and a wide pair of mag 10 stars on the NW side. The resolved stars are embedded in an unresolved glow of fainter stars, ~4'x2', extended E-W in a crescent shape, concave towards the north (arching north on the south side).

NGC 2041 (13"): at 105x, this LMC cluster appears bright, fairly small, round, 1' diameter, high surface brightness. Symmetrical appearance and increases to a very small bright core and a stellar nucleus. This young, massive cluster is located ~7' SE of the elongated cluster NGC 2034 at the east end of the very large, extended collection of associations (the "Quadrant") that includes NGC 2026 and 2002 on the western side.

"Eighth-Note" Nebula = LMC-N55 (30"): at 303x (without filter) + 152x (with NPB filter); even without a filter the "Eighth Note Nebula" is a gorgeous object, with ~75 stars (S-L 553) in a

7'x3' region elongated NW-SE. A very large, detailed nebula encompasses these stars. There are four main sections with the largest and brightest on the southeast end (N55A) extending ~2.5' diameter in an uneven, knotty circular glow. A couple of dozen stars are involved with N55A including a mag 13 star on the northeast end and a mag 12 star on its northeast side. A second small, detached 35" glow lies ~2' NW. Unfiltered, 4 or 5 mag 15-15.5 stars are involved. A larger roundish glow, extending 1', is 2' further NNW. A few mag 15 stars are involved and mag 11.5-12 HD 269722 (brightest in the cluster, type OBe) is 1.4' ENE. Finally the 4th and faintest piece is a 50" detached glow that is close north of the bright star. Three mag 14-14.5 stars are involved. The NPB filter enhances the nebulosity, presenting a showpiece object similar in detail to the Red DSS2 image! The three southern nebulous glows all have an irregular surface brightness and are connected by very faint nebulosity. NGC 2003 lies 8' W.

LMC-N64 (14"): Using an NPB filter, the emission nebula LHA 120-N 64B is a bright, large and irregular nebulous patch, about 3'x2' E-W. The brightest portion (N64A) is on the west side. A mag 11 star is ~2' N of the east end. Another 2' NNW of this star is a detached 40" piece (N64C) that was fairly easy with the filter. Unfiltered, three mag 13 stars in a 1.8' string are involved in the central portion, along with a couple of mag 14-15 stars, and a few stars are involved with N64C. Mag 8.8 HD 37853 is 6' NW. Emission nebula LHA 120-N 62A lies 16' NW.

LMC-N62A (14"): Using an NPB filter, the emission nebula N62A appeared very bright, very elongated ~E-W, relatively large, ~1.5'x0.4'. The shape is a bit irregular, but it has a sharply defined northern edge, with the southern edge weaker and more ill-defined. The nebula was visible unfiltered but displayed an excellent response to the NPB filter. A couple of very faint stars were visible with averted. BSDL 2348, an LMC cluster perhaps associated with the nebula, is ~2' W and contains a half-dozen mag 14-15 stars in a 1.5' knot, along with a mag 12.5 star on the west end.

3) LMC-N158/159/160

LMC-N158

NGC 2074 (24"): this prominent HII region (LMC-N158C) and cluster (OB-association LH 101) appeared as a very bright, very large "C" shaped nebula surrounding a semi-circular chain or crown of stars open to the SW. Two bright mag 10.4 and 11 stars oriented SW-NE (50" separation) lie on the northwest end of this crown. The northeastern luminary is a very close pair of OB-stars (TDS 3273 = 11.4/11.8 at 2") and the star at the southwest end (HD 269923) is the brightest in the cluster. On the opposite southeast end of the chain is a brighter mag 12.5 star (O3-class supergiant). A small bright knot, ~35" diameter, is superimposed on the general glow in the northeast side of the "C". At 216x at least 20 fainter stars were resolved in the chain besides the brighter stars at the ends. NGC 2074 is part of a huge complex (LMC-N158) stretching 11' SW-NE with NGC 2081, a bright HII region that lies just 8' NE. LMC-N158 is located roughly 20' SSE of the center of the Tarantula Nebula.

NGC 2081 (24"): At 214x, this is a gorgeous star cloud consisting of two dozen stars in a 5' region (stellar association LH 104 dominated by B-class supergiants), including many mag 13-14 stars as well as mag 12.2 star HD 38489 (an extreme luminous blue variable) on the northeast

side. Adding a UHC filter enhances a fairly bright HII glow that nearly surrounds the entire cluster in a triangular wreath (weak in the center)! The brightest portion is a ribbon with a bright region (identified in SIMBAD as BSDL 2722) at one end just south of the cluster and extending due east. With closer inspection BSDL 2722 actually consists of a couple of knots and fainter streaks intersecting! Just beyond the east end of this ribbon is NGC 2091, a slightly elongated cluster that is collinear with the streamer. HDE 269936, a mag 11 "star" (found to be an extremely compact cluster) is just off the SW side and NGC 2074, a bright HII region and cluster (part of the same complex LMC-N158), lies 8' SW.

LMC-N159

NGC 2078 (24"): this is the northwest component of an impressive 4' emission nebula filled with bright knots (LMC-N159), several of which form a curving "S" shape. At 200x and UHC filter it appeared as a fairly bright, moderately large glow surrounding a mag 12 star (B5 supergiant R148) and two fainter stars. This knot is elongated ~E-W, ~1.2'x0.8' and is encased in a fainter outer halo that extends perhaps 1.5', mostly to the north. NGC 2079, an extremely bright isolated patch, lies 1.7' S, NGC 2083 is a similar distance to the east, and NGC 2084 is 2.5' SE.

R148 forms a 6" pair - not logged - with the optical counterpart (V~14.8) of LMC X-1, a 10 solar-mass black hole and variable X-ray source. Nearby is the impressive LMC-N160 complex with NGC's 2077 and 2080, another very bright patch of nebulosity, 6' N and NGC's 2085 and 2086, a smaller bright pair, a similar distance to the NE. This complex along with LMC-N159 is within the O-association LH 105.

NGC 2079 (24"): this is the brightest section of an impressive 4' collection of perhaps 8 different emission knots (collectively LMC-N159) that are encased in a diffuse glow and carry four separate NGC designations. NGC 2079 (LMC-N159A) is situated on the southwest end of the complex and appeared extremely bright, ~1' diameter, with a uniform very high surface brightness. The outline has an unusual triangular shape (one vertex at the north end) with a well-defined border and appears detached from the main section. Without a filter, a faint star and ionizing source (DD 13, an unresolved pair of O-stars) is located at the center of the glow.

NGC 2079 is collinear with two mag 12 stars 1.7' N (at the center of 2078) and another mag 12 star 3.5' N. The main section of the complex to the northeast forms a large "S" shaped group of multiple knots with NGC 2078 1.7' N, 2084 to the east and 2083 to the NE.

NGC 2083 (24"): at 214x and UHC filter, NGC 2083 appeared as a bright, large, slightly elongated glow ~1.8' diameter, surrounding a mag 12.5 star (O-class supergiant). A brighter knot is embedded within the glow on the west side (LMC-N159I) on a line with NGC 2078. Removing the filter, the bright central star has a companion at ~7" and several other mag 14 stars are embedded in the periphery of the glow. On the southeast side is the 15th magnitude "star" N159-5, known as the LMC "Papillon Nebula". This very compact object (not resolved) is classified as a Young Stellar Object (YSO) and High Excitation Blob (HEB).

NGC 2083 is situated in the northeast section of the curving "S" shaped NGC 2078/79/83/84 complex (LMC-N159 and OB-association LH 105). This complex shares the same field with two additional bright emission regions - NGC 2085/86 4' N and NGC 2077/80 ~5.5' NNW

(LMC-N160), and the combined complex forms a superb field of bright HII regions ~35' SSE of the center of the Tarantula Nebula. Although Herschel assigned 4 NGC numbers within LMC-N159, I logged at least 7 different brighter knots (see NGC 2084 for more).

Papillon Nebula (25"): On the southeast side of NGC 2083 [44" SE of the O8.5-type mag 12.5 central star] is the 15th magnitude "star" N159-5, known as the LMC "Papillon Nebula" (butterfly shape on HST image). This very compact object is classified as a Young Stellar Object (YSO) and High Excitation Blob (HEB), a rare class of ionized nebulae associated with massive star formation. At 397x it appeared faint (15th mag) and quasi-stellar (though difficult to confirm as non-stellar).

NGC 2084 (24"): NGC 2084 forms the SE region of the complex and it's composed of several nearby components. At the NE end of this extended region is a moderately bright, round knot, ~45" diameter (N159G). Without a filter a star is involved with N159G (sketched by John Herschel but not catalogued). A second, brighter embedded "glow" is close WSW on a direct line with NGC 2079. This knot corresponds with John Herschel's position for NGC 2084 and is catalogued by Henize as N159C-east. It appeared very bright, fairly large, elongated, ~1.2'x1.0'. Removing the filter a couple of stars are involved (with one brighter star). Finally, N159C-west (also sketched by Herschel) lies 1.5' W of NGC 2084 = N159C-east in the center of the entire complex and is connected to NGC 2084 by a faint bridge of nebulosity. N159C-west appeared fairly bright, moderately large, round, 45" diameter.

LMC-N160 Complex

NGC 2077 (24"): this is the southwest component of a very bright, impressive 2' emission patch with NGC 2080. At 200x and UHC filter, NGC 2077 appeared bright, moderately large, elongated 2:1 E-W, ~1.2'x0.6'. Without a filter, three fainter stars are involved in the glow (one is a massive Wolf-Rayet star). Forms a close pair of with NGC 2080 (Ghost Head Nebula) 1.1' NE.

NGC 2085 and 2086, a smaller pair of bright HII glows, lie 3' and 4' ESE, and the entire collection forms LMC-N160. In addition, a bright complex of HII knots including NGC 2078, 2079, 2083 and 2084 (LMC-N159 and O-association LW 105) lies 5' S. Together these groups form a stunning field about 35' SSE of the Tarantula Nebula.

NGC 2080 = Ghost Head Nebula (24"): at 200x and UHC filter, this emission nebula is very impressive, appearing as an extremely bright nebulous glow with an irregular shape, ~1.5' diameter, slightly elongated. The brightest section is encased in a larger, fainter nebulous glow that extends mostly to the south. NGC 2077, a bright HII glow, is attached on the SW side with their centers just 1' apart. At 350x the view was fascinating with 3 or 4 "stars" embedded (the brightest one or two appear to be quasi-stellar knots) and NGC 2080 had a curdled texture. A couple of brighter mag 13/14 stars are off the NW side and a number of stars trail off to the east and NE (part of the O-association LH 103). Located 30' SSE of the center of the Tarantula Nebula.

Along with NGC 2085 and 2086, another pair of knots ~3' SE, this group forms LMC-N160. Roughly 6' S is LMC-N159, another stunning group of nebulous glows consisting of NGC 2078,

2079, 2083 and 2084. NGC 2080 is the brightest region in the LMC-N159/160 complex and is nicknamed the "Ghost-Head Nebula" from a 2000 HST image. The two "eyes" of the Ghost (noted as quasi-stellar above) are rare, compact "high excitation blobs" (HEBs) discovered in 1986.

NGC 2085 (24"): this HII knot is part of an amazing field of nebulous glows located ~35' SSE of the Tarantula Nebula. At 200x using a UHC filter, NGC 2085 appears bright, fairly small, ~25" diameter. A mag 10.0 star (supergiant HDE 269953) is just off the NE end (23" from the center). NGC 2085 forms a close pair with NGC 2086 = IC 2145, a similar knot just 1.2' E. Both of these knots are immersed in small, much fainter nebulous halos but the bright star itself does not appear to be involved. Viewing with the filter, the field is divided up into three main groups with NGC 2085 and 2086 forming a close E-W pair separated by a mag 10 star. NGC 2080 (brightest section in the LMC-N159/160 complex) and NGC 2077 lies ~2.5' NW and an impressive cluster of nebulous knots (NGC 2078, 2079, 2083 and 84) is roughly 6' SSW.

NGC 2086 = IC 2145 (24"): this is the eastern component of a close pair of nebulous glows with NGC 2085 just 1.2' W. This pair is part of a fascinating group of numerous emission nebulae (LMC-N160 and LMC-N159) just 35' S of the Tarantula nebula. At 200x with a UHC filter, this knot appears very bright (slightly brighter than NGC 2085), fairly small, round, ~30" diameter. Without a filter a faint star is near the center. Mag 10 supergiant HD 269953 (misidentified as NGC 2086 in the ESO catalogue), which is nearly attached to the NE side of NGC 2085, lies 1' W.

4) Sextant Arc

The "Sextant Arc" of the LMC consists of NGC 1955, 1968, 1974 and associations LH 51, 54, 60, 63. Nail and Shapley (1953) called this region "Constellation III", one of several "Constellations" of blue supergiant stars in the LMC. This complex is part of a supergiant shell of HI and HII regions called LMC 4, likely the result of supernovae and O-type stars near the center of LMC 4.

NGC 1955 (30"): this cluster and emission nebula is near the western end of a beautiful curved chain of bright clusters involved with prominent nebulosity (referred to as the "Sextant Arc") that extends 17' WSW to ENE and includes NGC 1966 and NGC 1974 to the NE and S-L 456, a group of stars and nebulosity 4' W of NGC 1955. The cluster, which is part of stellar association LH 54, includes as many as 40 stars in a 4' region including a half-dozen mag 11.5-12.5 stars in a 3' gently curving arc elongated E-W. The cluster is immersed in a large, irregular haze that is brightest on the eastern side in a 30" circular glow. This is a locally brighter portion of a large irregular loop bowed out to the east and extending N-S for 6'-7' to a mag 9.5 star 3.5' S of the cluster. A fainter group of stars and haze lies 4' W (S-L 456 within association LH 51) and the DSS reveals both halves form an 8' bubble (LHa 120-N51D) like a Wolf-Rayet shell or supernova remnant. NGC 1968 lies ~8' ENE and NGC 1974 11' NE.

S-L 456 (30"): faint group of stars and nebulosity that lies 4' W of NGC 1955 (S-L 456 within association LH 51) and forms the western end of the "Sextant Arc" with NGC 1955, 1968 and 1974.

NGC 1968 (30"): third in a great chain of clusters involved in extensive nebulosity oriented southwest to northeast. The cluster is bright and very elongated 3'x1' E-W with ~20 stars including a number of mag 12-13 stars. The cluster (part of association LH 60) is surrounded by nebulosity (Henize N51C) that brightens on the east end in a large, round knot and extends beyond the cluster on the south side for several arc minutes in the direction of NGC 1955 to the west. NGC 1968 is connected to NGC 1974, another nebulous cluster 3' NE and NGC 1955 lies 8' WSW. The entire complex is nicknamed the LMC "Sextant Arc".

NGC 1974 (30"): fourth in a great looping chain of clusters and nebulosity (collectively called the "Sextant Arc") including NGC 1955 and NGC 1968 to the SW. This group is virtually attached to NGC 1968, only distinguished by less nebulosity and stars. There are roughly three dozen stars resolved in a 3' circular group (stellar association LH 63) including a number of mag 12-13 stars. The cluster is involved in fairly bright nebulous haze (Henize N51A) and is part of LH 63 association.

5) Seagull Nebula (LMC-N57 Complex)

NGC 2030 (24"): this is the NW component of the Seagull Nebula; a bright, highly structured 7'x5' emission nebula. The brightest portion of NGC 2030 is a bright streak elongated E-W that extends west from mag 12.3 HD 269810. A large mass of nebulosity spreads to the north from this streak in a more circular 2' patch. This object is incorrectly identified as NGC 2029 in modern catalogues and atlases.

NGC 2032 (24"): this is possibly the brightest section of the Seagull Nebula in the LMC (similar to NGC 2035 1.6' SE). It consists of a very bright, elongated ~SSW-NNE patch, 2'x1', with an unusual kidney-bean shape that is indented or concave on the east side. NGC 2032 is just separated to 2035 by an elongated SSW-NNE on the east side. A faint, thin streamer of nebulosity shoots to the north from 2032. Mag 11.4 HD 269808 is off the SW side.

NGC 2035 (24"): this is the southeast section of the bright Seagull Nebula in the LMC. At 200x using a UHC filter it appeared very bright, moderately large, with a very irregular shape similar to an anvil. The very knotty, complex structure was elongated N-S, 1.6'x1.0', with the widest part of the anvil on the south end. NGC 2032, another very bright section, is very close preceding (roughly 1.6' between centers) and the two sections are separated by a dark lane oriented SSW-NNE. A very faint streamer attached on the NE side flows to the north (NGC 2032 has a similar but brighter streamer). A fairly small detached patch, ~1.2' in diameter, is close SE (identified as LHA 120-N59C in SIMBAD).

LMC-N59C (24"): although not plotted on the Morel close-up chart of the Seagull Nebula, I noted a fairly small detached patch, ~1.2' in diameter, close SE of much brighter NGC 2035. Also located 2' W of mag 10.4 HD 269847.

NGC 2040 (24"): this is a bright, irregularly round glow, ~2' diameter, located ~4' ENE of the Seagull Nebula and part of the same emission complex. The nebulosity surrounds a cluster of roughly 15 stars. Excellent contrast gain using a UHC filter at 200x which reveals a very

irregular outline. The POSS image shows delicate filaments to the south forming a large loop or shell (possibly a SNR shell) although this extension was not recorded.

KMHK 1098 (24"): before viewing the Seagull Nebula (NGC 2029-32-35-40), I picked up this very small, moderately bright knot adjacent to a mag 13 star. Without a filter this object has a bright, quasi-stellar core. Adding a UHC filter increased the size to 20", so there appears to be an emission component. Located 2.5' SW of mag 9.3 HD 269804 and 6' NW of the Seagull Nebula.

NGC 2014 (30"): very bright, large cluster or star cloud (stellar association LH 76) with nebulosity, ~50 stars resolved in a 5' region (no distinct boundary on the north side), including many in a 2' string, elongated N-S. A mag 10 star (brightest in the cluster) is at the south end of this string. A portion of the cluster is immersed in nebulosity (LMC-N57A), most prominently on the SE side of the cluster. Irregular haze (roughly elongated SW-NE) extends out of the cluster for a couple of arc minutes on the east side, spreading south and north. Forms an interesting contrast with emission nebula NGC 2020 5' ESE. The remarkable Seagull Nebula (NGC 2030, 2032, 2035) lies ~20' NE.

NGC 2020 (30"): fairly bright, roundish annular emission nebula, slightly elongated SW-NE, 3'x2.5'. The inner edge of the annulus is slightly brighter and sharply defined with a relatively large dark center, ~45" x30". North of center in the ring is a 13th magnitude star, which appears roughly centered in the emission nebula. A 12th magnitude star lies 1.3' S of the central star, at the southern edge of the nebula. Two fainter stars are just north and south of the mag 12 star and the trio is collinear with the central star. Forms a striking due with NGC 2014 (cluster and emission nebula) 5' WNW. The remarkable Seagull Nebula (NGC 2030, 2032, 2035) lies 15' NE.

NGC 2021 (30"): bright, compact knot surrounding two resolved stars, slightly elongated, ~20"x15". This knot is in the northern end of a very large, elongated cluster or star cloud (S-L 567). Extending mostly south of NGC 2021 is a very elongated stream of stars, 5'x1', including a mix of brighter and fainter stars (stellar association LH 78). The densest concentration is a 2' group (S-L 567) on the south end with a number of mag 12-14 stars. Roughly a total of 50-60 stars were resolved. The Seagull Nebula complex (NGC 2030, 2032, 2035) lies 12' SE.

6) Bean Nebula (LMC-N11 Complex)

NGC 1763 (30"): The Bean Nebula complex (LHA 120-N11) is the second largest stellar nursery in the LMC after the Tarantula Nebula. The showpiece is NGC 1763, the Bean Nebula, which sits near the center of a stunning field of emission nebulae and clusters including NGC 1760 7' S, NGC 1761 3' S, NGC 1769 6.5' SE, NGC 1773 8' ENE and NGC 1776 11' E. NGC 1763 is a very bright, very large irregular nebula, shaped like a kidney-bean or a fetus. The main body extends 5'x3', elongated SW-NE with a bulbous portion on the NE wide and an indentation (weaker nebulosity) on the south side. Overall the surface brightness is very high, though uneven, and much fainter haze and filaments flow out from the Bean in most directions. Within the main body, the nebula is brightest in a loop on the SW side and secondly in a section on the NE side. Superimposed on the Bean Nebula is a large cluster, catalogued as stellar association

LH 10, with roughly two dozen stars resolved including a number of 12-13th magnitude stars. On the NE end is an E-W string of 3 stars along with IC 2116, a bright, high surface brightness knot, ~15" diameter. Very faint haze at the edge of NGC 1763 appears to extend from IC 2116. The surrounding field is rich in stars between the individual objects with some individual locally brighter knots of nebulosity.

NGC 1760 (30"): appears as a 1.7' E-W string of a half-dozen stars over fairly bright nebulosity. The emission haze is brightest just south of the string and extending to the west of the string a couple of arc minutes. Irregular nebulosity also branches out to the south of the string for another 2' and involves a mag 12 star. Another 2' string of N-S stars is on the west side of the haze.

NGC 1760 is at the SW end of a stunning complex (LHa 120-N11) of clusters and nebulosity including NGC 1763 = Bean Nebula, a showpiece nebula and cluster centered 7' NE; NGC 1761, a larger cluster and nebulosity just 3' N; NGC 1769, a bright emission nebula 8' NE; along with NGC 1773, NGC 1776 and IC 2115. Lucke and Hodge assign NGC 1760 and 1761 to stellar association LH 9.

NGC 1761 (30"): bright, large cluster sandwiched between the showpiece Bean Nebula (NGC 1763) to the north and NGC 1760 to the south. There are roughly 80 stars mag 11 to 16 in a 3.5' irregularly shaped group over some background haze. The stars are fairly even distributed except for a detached 1.3' group of 10-12 stars off the NW side. Including this detached section, the overall size of this star cloud (association LH 9) is 5'x3.5'. A close bright double star (probably h3716 = 10.2/10.9 at 5") is on the NW side of the main group.

IC 2116 (30"): bright, high surface brightness knot, ~15" diameter. Located at the NE edge of the showpiece Bean Nebula (NGC 1763), roughly 3' NE of the center, and certainly part of the same complex. Very faint haze at the edge of NGC 1763 appears to extend from IC 2116. IC 2115 appears to be a mag 11 star, just 0.8' W, although there is no emission so this identification may be incorrect.

NGC 1769 (30"): bright, large oval nebula oriented SW-NE, roughly 3'x2'. There are three or four stars in the center with the brightest 12th magnitude. A small, bright knot is on the south side, just 1' S of the mag 12 star. Roughly centered within the stunning NGC 1763 (Bean Nebula) complex with showpiece NGC 1763 just 6.5' NW, NGC 1761 6' WSW, NGC 1776 6' NE, NGC 1760 8' SW and NGC 1773 7' NNE.

NGC 1773 (30"): fairly large, bright glow, oval 3:2, 2.2'x1.5'. On first glance, two brighter stars are offset SW of the geometric center and separated by 15", but on closer inspection the more central star resolves into a very close double. In additional a couple of fainter stars are superimposed on the north side of the glow. The nebulosity is slightly irregular in surface brightness and brighter along the rim, particularly on the SW side. This emission nebula is located at the NE end of the NGC 1763 (Bean Nebula) complex with NGC 1763 centered 9' SW, NGC 1769 7' SSW and NGC 1776 5' SSE.

NGC 1776 (30"): located on the east side of the NGC 1763 (Bean Nebula) complex, this cluster is moderately bright, fairly small. Well concentrated with a small bright core surrounded by a 50" halo. A couple of extremely faint stars are just visible in the halo. Located 5' SE of emission nebula NGC 1773, 6' ENE of emission nebula NGC 1769 and 2.7' NE of a mag 10.8 star.

7) LMC-N44 Complex

NGC 1929 (24"): this HII knot is the first in an impressive star cluster/emission complex (stellar association LH 47) that extends over 7' in size and includes NGC 1934, 1935, 1936, 1937, and IC 2126. At 260x it appeared as a bright, moderately large, round glow of ~50" diameter surrounding a 13th magnitude star.

On the DSS this object appears to be a symmetrical bubble. This HII complex and cluster includes the superbubble complex N44

NGC 1934 (24"): this is a locally brighter patch in the NGC 1929-34-35-36-37 complex (stellar association LH 47), situated very close northwest of NGC 1935. This patch is not as well defined as the other NGC objects in this bright HII complex but is noticeable as it involves a couple of brighter mag 12 stars and a number of fainter stars.

S-L 417 (24"): rich concentration of stars superimposed on the entire LMC-N44 complex, including the HII regions NGC 1929, 1934, 1935 and 1936 off the south side.

NGC 1935 (24"): this emission glow forms the NW pair with NGC 1936 in a very striking field of clusters and HII patches (part of stellar association LH 47). At 200x and UHC filter it appeared as a very bright, round glow of uniform high surface brightness. The size is slightly smaller than NGC 1936, perhaps 45"-50" in diameter. Good response to the UHC filter. Nebulosity also extends off to the NW of NGC 1935 and a locally brighter patch (NGC 1934) involves a couple of brighter stars. Superimposed on this entire complex of HII knots is a rich concentration of stars (S-L 417 = KMHK 822).

NGC 1936 (24"): NGC 1936 appeared as a very bright, round glow, ~1' diameter with a very high, uniform surface brightness at 200x using a UHC filter. Situated at the south end of a large cluster and HII complex. Additional fainter nebulosity sweeps to the south and is connected with a fainter (anonymous) patch to the west by 1'. This extension increases the total size to 2' to 2.5'. NGC 1935 lies 2' NW.

NGC 1937 (24"): this object is the furthest NE in a gorgeous field of stars and HII regions. NGC 1937 is a large nebulous patch, ~3.7'x2.7' in size, with ~20 stars resolved over the bright glow. Excellent contrast gain using a UHC filter at 200x. The cluster or star cloud (association LH 48) includes a string of stars oriented WSW-ENE that passes through the center including a mag 11 star. NGC 1936, a very bright nebulous glow, lies 5' S, and other sections of the N44 superbubble complex (see http://www.universetoday.com/am/publish/gemini_interstellar_cavern.html) lie to the SW

including NGC 1929, 1935 and IC 2126. Superimposed on this complex of HII glows is a fairly rich concentration of stars.

IC 2128 (14"): Using a NPB filter a bright, compact patch, ~30" diameter, was prominently visible just 1' SW of a mag 10 star. Much fainter nebulosity spreads out to 1.5'. Three mag 13-14.5 stars are involved without the filter and a few more are further northwest. A mag 9.2 star is 4.2' W and a mag 11 star is 2.1' NNE. The IC 2128 nebula is located at the southeast end of the NGC 1929-1936 complex (LMC N44) and it is part of association LH 49.
LMC-N44H (14"): a moderately bright, detached glow, ~30" diameter, was noticed 2.3' N of IC 2128 using a NPB filter. A star is involved unfiltered. A mag 10 star is 1.1' ESE. Part of the NGC 1929-1937 HII complex and association.

8) NGC 1850 region

NGC 1836 (24"): bright LMC cluster, relatively large, high surface brightness, very elongated NW-SE, 1.2'x0.4'. The dominant portion of the cluster is on the NW end and appears bright, roundish, 25"-30" diameter with a few stars resolved just outside the glow. A 14th magnitude star is off the SE side and connects to a small knot containing a very tight string of 15th magnitude stars. Forms a striking pair with NGC 1839 2.5' E. HS 109 is 5.4' S and several other small clusters are in the field.

NGC 1839 (24"): very bright cluster forming a striking pair with NGC 1836 just 2.5' W. At 200x appears as a very high surface brightness irregular glo, ~30" diameter, mottled but not resolved. A group of six mag 13-14 stars is off the west side in two short N-S strings. Several fainter clusters are in the field including HS 117 5' SSE, HS 109 6' SSW and S-L 234 6' SE.

NGC 1847 (24"): very bright LMC blue globular, moderately large, irregular elongated shape, high surface brightness glow with a small fainter halo, ~0.6'x0.4'. At 200x, several mag 14.5-15.5 stars are resolved (a couple are fairly easy) within and at the edges of the central glow. NGC 1825 lies 15' WNW, NGC 1856 is 16' SE and NGC 1855/1858 are ~15' NE.

NGC 1850 (24"): at 350x in the 24" I was stunned by the view of this huge, extremely bright, blue globular cluster! The outer halo, which extends 5' in diameter, was resolved into dozens of faint stars arranged in irregular star chains that appear to stream out of the core. A single brighter mag 13 star is superimposed on the west side [30" W of center is the core of companion cluster N1850A]. The center is highly concentrated with an extremely bright 1' core that appears elongated, irregular and clumpy with a curved outline. A small, 20" diffuse glow is embedded at the north edge of the halo (open cluster S-L 260). NGC 1850 resides in a glorious LMC region that is packed with an unbelievable number of clusters and HII regions including NGC 1854 6' SE and NGC 1858, a huge cluster and nebulosity, ~10' SE.

18": After the Tarantula region (30 Doradus complex), NGC 1850 is the brightest star cluster in the LMC. At an estimated age of only 40-50 million years, this rich globular-like cluster has no counterpart in the Milky Way! At 128x, the cluster appeared very bright (9th magnitude), large, round, ~3.5' diameter, well concentrated with an intensely bright 1' core. A brighter mag 13 star

is superimposed on the western side of the halo. Several very faint stars are resolved in the very lively halo.

NGC 1850 lies in a very impressive region of the LMC (near the outskirts of the central bar) with 13 additional NGC clusters/nebulosity within 30' including NGC 1854 7' SE, NGC 1858 10' SE, NGC 1856 22' SSE and several others including NGC 1836, 1839, 1847, 1860, 1863, 1865. Unfortunately dawn was starting to break so I only was able to view the first group of objects mentioned above and I need to return to this field! See image at http://antwrp.gsfc.nasa.gov/apod/ap010712.html.

NGC 1854 (24"): I revisited this remarkable field after viewing NGC 1850 (located 6' NW) the previous night. At 200x this cluster appeared very bright, large, round, with a brilliant core. At 350x, it was resolved into numerous faint stars around the edges of the intense core. Up to a couple of dozen very faint stars popped in and out of visibility. The core is noticeably elongated N-S and is surrounded by a large, much fainter halo. There is a small clump of stars at the NW edge. NGC 1858, a large star cluster and nebulosity, lies 4' SE.

NGC 1855 (24"): see description for NGC 1854. According to John Herschel's descriptions, NGC 1854 refers to the core and 1855 refers to the halo of this large cluster.

NGC 1856 (18"): at 128x, this LMC rich cluster appeared bright, moderately large, 1.5' diameter. Well concentrated with a very bright 30" core similar to a globular cluster. Located 2' N of mag 9.4 HD 34144 and 23' SSE of NGC 1850.

NGC 1858 (24"): this would be a fascinating nebula and cluster (association LH 31) if it were isolated, but is even more striking situated at the southeast end of a wonderful chain with the bright cluster NGC 1854 and NGC 1850, which is one of the top showpieces in the LMC. At 346x about two dozen stars were superimposed over an elongated glow and many other stars are just outside the glow. At 200x with a UHC filter, the nebula is very bright overall with a 30" very high surface brightness patch at the north end. The nebula is brightest along the west and east border and weaker in the center. The elongation is towards a mag 12 star on the south side. NGC 1854 lies 4.5' NW.

18": third of three bright objects in a NW to SE string with NGC 1850 and NGC 1854/55. This is a large and very unusual cluster with nebulosity. There is a bright knot attached near the NW edge, ~15"-20" in diameter. This knot responds very well to a UHC filter at 76x (27 Panoptic). An obvious elongated patch of nebulous haze curves to the SE with several mag 13 stars involved with the glow and extended N-S. Overall, the size of the cluster/nebulosity extends to 3.5'x2'. Located 4.5' SE of NGC 1854.

NGC 1860 (24"): this LMC cluster was fairly faint, moderately large, possibly elongated slightly N-S, ~35"x30", very weak concentration. A mag 10 star lies 1.7' SW. Picked up after viewing NGC 1863 (5.5' ENE) and NGC 1865 (9.5' ESE). The amazing field containing NGC 1850 (brightest cluster in the LMC), NGC 1854 and 1858 is just to the SW.

NGC 1863 (24"): at 200x this LMC globular appeared very bright, moderately large, irregular outline, ~40" diameter, high surface brightness. A faint star or clump is at the NE edge. Forms a pair with NGC 1865, located 5' SE. The remarkable field containing NGC 1850 (brightest cluster in the LMC), NGC 1855 and 1858 lies 15' SW.

NGC 1865 (24"): at 200x this LMC cluster was fairly bright, fairly large, round, 1' diameter with a weak concentration and no resolution. It has a symmetrical appearance like a globular. Located 5' SE of the bright cluster NGC 1863.

HS 109 (24"): picked up while viewing NGC 1836 and 1839, a bright pair of clusters 6' N. At 200x appeared moderately bright, fairly small, irregular, 25"-30" diameter, a few very faint stars resolved.

HS 117 (24"): moderately bright, fairly small, roundish, 25"-30" diameter, involves a 14th magnitude star. Picked up while viewing NGC 1836 and 1839, a bright pair of clusters ~6' NW. S-L 234 lies 2.7' ESE and HS 109 is 4.4' WSW.

8) LMC-N79 and LMC–N83 region

NGC 1712 (18"): first of three clusters with nebulosity including NGC 1722 + IC 2111 4' NE and NGC 1727 8' NE. At 128x it appeared as an irregularly shaped, 4' nebulous haze just north of an attractive mag 10.7/11.5 double star (17"). A half dozen faint stars are embedded in the haze (part of LMC-N79) besides the two brighter stars at the south edge. This is a young LMC cluster and forms the western portion of association LH 1.

NGC 1722 (18"): in a small group of LMC clusters with nebulosity including NGC 1727 and NGC 1712. At 128x appears as a fairly faint, irregular hazy region with a few stars resolved and a small, bright knot (IC 1211). Good response to the UHC filter. Located 4' SW of NGC 1727. This is a very young open cluster with an unevolved main sequence and forms the eastern component of association LH 2.

IC 2111(18"): this LMC emission nebula/cluster appeared as a very small, high surface brightness knot, ~12" diameter, embedded within NGC 1722. A mag 12 star lies close SW.

NGC 1727 (18"): fairly bright, fairly large, irregular patch, ~2.5'x1.5', with at least a half-dozen stars mag 13 stars resolved. This LMC cluster with nebulosity responds well to a UHC filter at 128x. A small extension is visible to the southeast (KMHK 187 = LMC-N79D) increasing the size to ~3.5'x1.5'. In a group with NGC 1722 4' SW and NGC 1712 7.5' SW. Located 4' N of mag 8.5 HD 31722. This is a very young cluster or association (LH 2) with an unevolved main sequence similar to nearby NGC 1722.

LMC-N79D (18"): this is a small extension or barely detached piece off the SE end of NGC 1727 in the LMC. SIMBAD identiifies this nebula as KMHK 187 (from Kontizas et al, "The cluster system of the Large Magellanic Cloud" in Astron. Astrophys. Suppl. Ser., 84, 527), though it was catalogued earlier by Henize (79D) as an emission object.

NGC 1737 (24"): at 200x appears as fairly faint nebulous patch centered ~1.8' NNW of the core of NGC 1743 and appears nearly connected. The outline is irregular and roughly 45" diameter with a couple of mag 14 stars involved on the south side. In an impressive complex of nebulosity (within LMC-N83 and association LH 5) with NGC 1745 and NGC 1748 as well as cluster NGC 1756.

NGC 1743 (24"): brightest section of an excellent HII/cluster complex including NGC 1737, 1745, 1748 and 1756. At 200x NGC 1743 appeared very bright, moderately large, ~50" diameter. Contains a very high surface brightness "core" with a fairly bright star involved. A larger "halo" extending mostly north roughly doubles the size to ~1.7'. NGC 1737, a faint extension with a couple of stars involved, is 1.8' NNW. NGC 1743 and NGC 1748 (a bright high surface brightness knot 2' NE) are embedded within a very large, irregular, low surface brightness haze extending ~3' (stellar association LH 5 and emission nebula LMC-N83), oriented roughly from NGC 1743 on the SW side to NGC 1745 on the NE end.

NGC 1745 (24"): fairly faint, fairly large nebulosity with a half dozen mag 13.5-14.5 stars involved, ~1' diameter. Located on the NE side of the NGC 1743 complex (association LH 5 and emission nebula LMC-N83), ~1.5' N of NGC 1748 and 3' NE of NGC 1743, the two main sections of the complex.

NGC 1748 (24"): this HII region (LMC-N83B) appeared as a bright, small, high surface bright knot in a striking group of nebulae, 20" diameter. A couple of stars are involved in the bright glow. A mag 10.3 star is 1.9' SW. NGC 1743 lies 2' SW.

LMC-N83B-1 (25"): At 397x this high excitation H II blob [HEB] appears as a 13th magnitude "star" (HST gives a diameter of 2.4") at the southeast edge of NGC 1748. According to Heydari-Malayeri, these unusual objects represent "early stages of massive stars emerging from their embryonic molecular clouds". It forms a fairly close "double" (6"-7" separation) with a second star closer to the center of NGC 1748.

NGC 1756 (24"): moderately bright cluster, relatively large, round, 1.0' diameter, broad concentration with no nucleus or resolution. Located ~5' SE of the NGC 1743 HII complex (LMC-N83) and stellar association LH 5, which includes NGC 1737, 1743, 1745 and 1748.