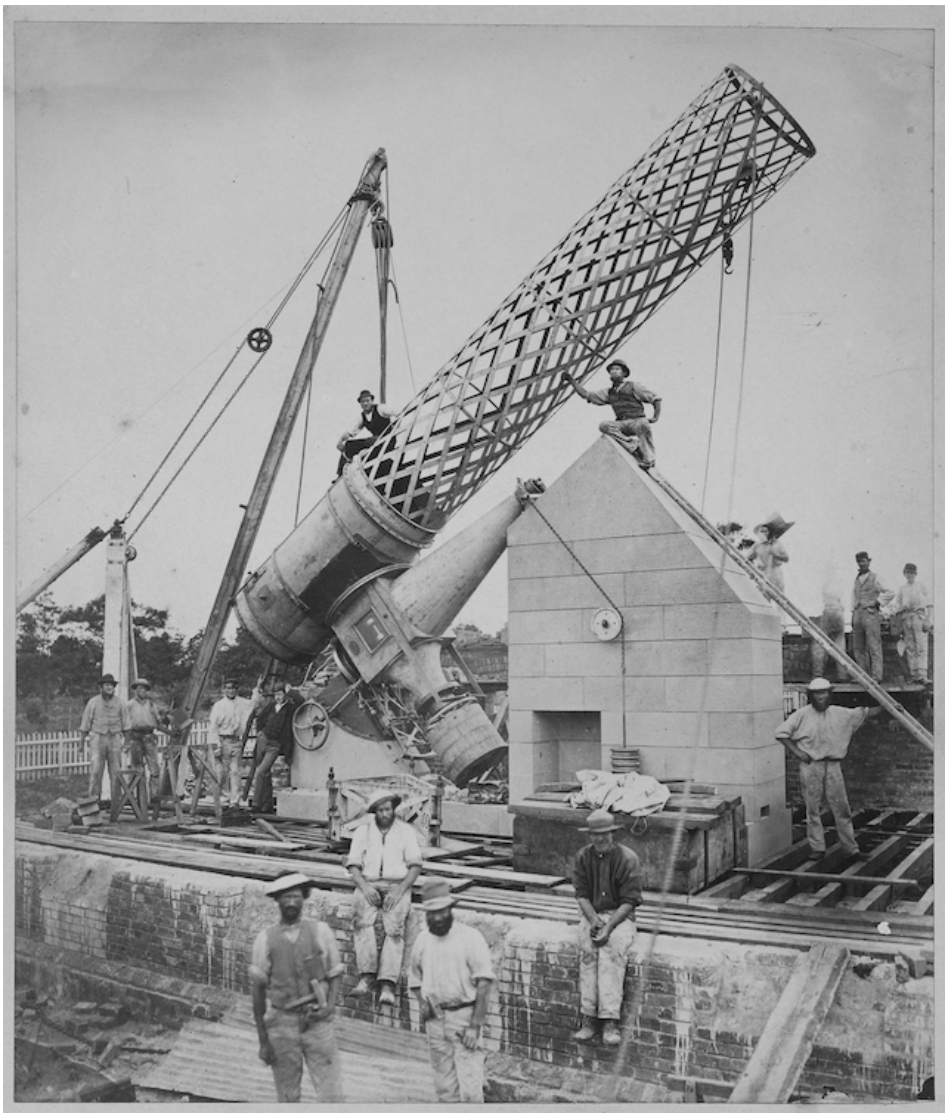
The lost Deep Sky discoveries with the Great Melbourne Telescope

When the 48-inch f/41 Great Melbourne Telescope (GMT) began service in 1869 it was by far the largest telescope in the Southern Hemisphere. With an innovative Cassegrain optical design, open lattice tube and equatorial mounting by father and son Irish telescope engineers Thomas and Howard Grubb, expectations were sky high for spectacular new discoveries.



Erecting the Great Melbourne Telescope, 1869 (Credit: Museums Victoria)

Thirty-five years earlier John Herschel surveyed the southern skies with his 18.5-inch f/13 speculum reflector from the Cape of Good Hope in South Africa. Herschel produced a monumental catalogue with over 1700 southern nebulae and cluster, nearly 1300 of which were new, and a list of over 2000 double stars. Herschel also compiled an extensive catalogue of the stars, clusters and nebulae in the Magellanic Clouds and documented spectacular outbursts of Eta Carinae.

One of the primary missions of the GMT was to follow up on Herschel's sketches of nebulae and see whether changes could be documented in the structure of these mysterious objects. Unfortunately, there were issues with both the telescope and the observing program that significantly hindered the observatory's output and results.

The mirror started off with a "mealy" appearance as the wrong solvent was used to remove a shellac coating that was applied to protect the surface during transport and the eye-stops (baffles) for the supplied eyepieces were incorrectly removed. Even when these issues were rectified, the number of clear, transparent nights was limited and the massive speculum mirror tarnished quickly in the moist Melbourne weather. The observatory had difficulties in hiring a first-class astronomer to follow through on the observing program. But most importantly, the program itself, to detect changes in nebulae, was ill fated. Factors including variability in observing conditions and the subjective nature of recording and sketching details near the limit of visibility could not be controlled. And more importantly, the astronomers were unaware that the targeted objects (both emission nebulae and galaxies) were much too distant to display any physical changes over a human lifespan, so the project goals were doomed to inconclusive results.

Robert Ellery, the director of the observatory, published one major paper on the results: "*Observations of the Southern Nebulae made with the Great Melbourne Telescope from 1869 to 1885. Part I. Melbourne*". It included sketches and descriptions of many nebulae, but only two new (both insignificant) objects were mentioned. Despite the expectation to publish additional observations, the lack of both financial resources and an effective method to produce lithographs of the sketches squashed that goal. The last observations with the telescope were made around 1890. George Ritchey, the architect of the 60-inch and 100-inch Mt. Wilson reflectors, considered the GMT an abject failure and wrote it was "one of the greatest calamities in the history of instrumental astronomy; for by destroying confidence in the usefulness of great reflecting telescopes, it has hindered the development of this type of instrument…for nearly a third of a century."

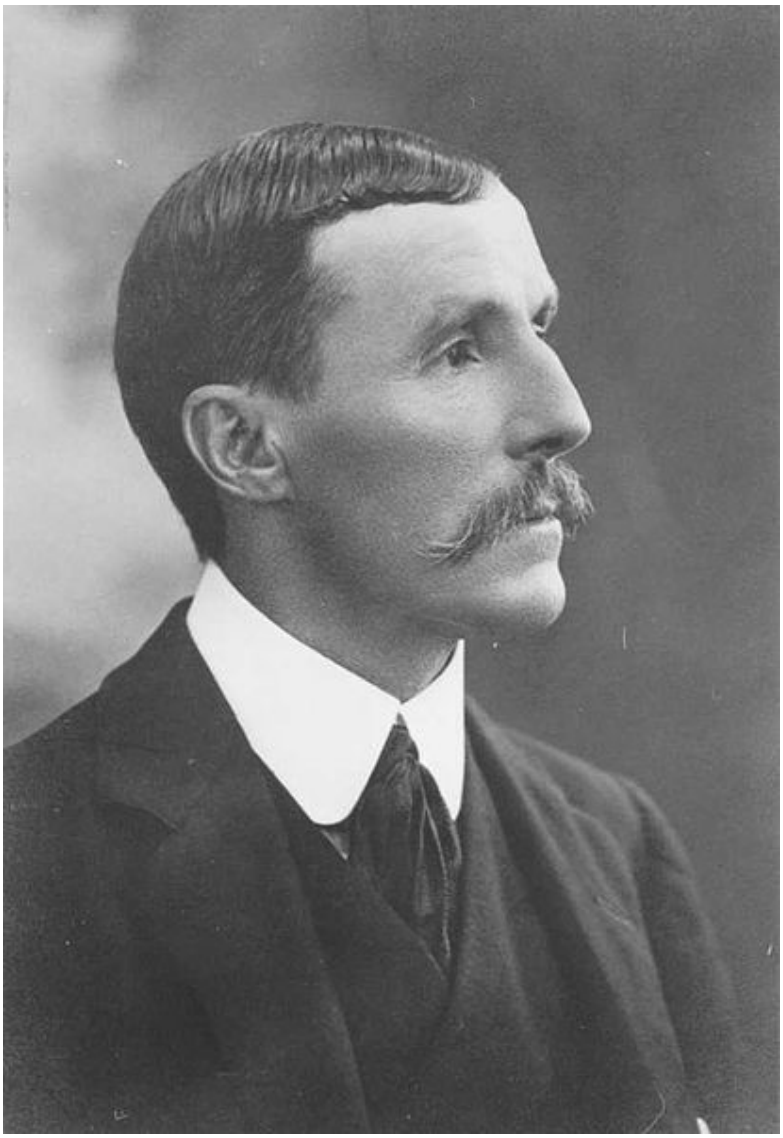
Nevertheless, the 48-inch telescope was in active service in Melbourne for 20 years. I've been curious for quite awhile if other unpublished discoveries were made with the telescope. Despite the limited program of reexamining objects discovered by John Herschel and looking for evidence of change, many new nebulae should have been picked up in the same field as well as many faint galaxies beyond Herschel's light grasp situated within rich southern galaxy clusters.

The October 2018 issue of Sky & Tel had a very interesting article by Trudy Bell on the restoration of the GMT by volunteers of the Astronomical Society of Victoria using surviving original parts. This got me thinking again about the paucity of new objects found with the GMT.

Bell's article mentioned that the Museums Victoria owned the GMT parts and I found a number of images of the observatory and lithographs of sketches that were prepared for publications including the first to reveal NGC 1365 as a barred spiral. This let me to scan the Annual reports of the "*Board of Visitors to the Observatory: together with the Annual Report of the Government Astronomer*". The 20th report from 1885 stated, "of the 172 nebulae observed, 140 are Herschel's, 3 are new one discovered by the late Mr. Turner, and 29 new or not identified, found by Mr. Baracchi" and the 21st Report (1886) reported, "…30 nebulae were found, but not identified in the catalogues, and may therefore be regarded as new." So, now I knew there were over 60 nebulae discovered with the GMT (59 by Mr. Baracchi) only two of which were credited

in the NGC!

Starting in 1883, Pietro Baracchi was hired as the principal observer on the telescope. He spent the next year testing and improving the mechanical operation of the telescope to eliminate instrumental errors in determining positions. In 1884 he started the process of reexamining Herschel's nebulae and continued this work for the next 4 years, until April 1888.



Pietro Baracchi, GMT astronomer, 1851-1926

After searching online I was able to locate scans of his original notebooks on the National Archives of Australia website and spend several days mesmerized by reading through Baracchi's logs, which documented dozens of his previously unknown discoveries! In some cases, he simply made careful diagrams, including the position of the nebulae with respect to nearby field stars. In other cases, he computed accurate positions (to within a few arc seconds) by timing offsets from known stars. As I originally suspected half of his discoveries are located in galaxy clusters; 17 in the Centaurus cluster, 6 in the Hydra I cluster and 6 in the Antlia cluster. It's unfortunate these discoveries were never published as they would have demonstrated the capabilities of this great telescope!

10 Dec 1884: S-L 92

Baracchi discovered this faint LMC Shapley-Lindsay cluster while observing NGC 1755 and 1749. His sketch shows S-L 92 to the southwest of NGC 1755 [5' separation] and just west of a line formed by two stars to its south (one is 10th magnitude HD 31961). He described it as "Very faint, a little elongated, no condensation...This precedes [NGC 1755] by 49 seconds and is 3' south of it." This offset lands within 30" of S-L 92. Baracchi questioned why Joseph Turner, the previous observer on the 48-inch, had missed this nebula -- "It is very faint but not fainter than [NGC 1749]. You can't say what shape it has - but it is there." He confirmed the observation on 10 Feb 1885. This cluster is Baracchi's first of at least 57 uncredited discoveries, besides two minor LMC objects, NGC 2043 and 2072.

11 Dec 1884: S-L 676 and S-L 684

This pair of LMC clusters was discovered while observing NGC 2107 (GC 1305). His sketch accurately placed both clusters with respect to each other and NGC 2107 (labeled "a"). S-L 684 (labeled "b") was called "extremely faint, shapeless - perhaps roundish, small, vlbM. Follows (a) by 27 seconds and is 3' 50" north of it." He described S-L 676 (labeled "c") as "Just a little brighter than (b) but still extremely faint - can't see any distinct shape - roundish perhaps - vgbM. Precedes (a) by 4 seconds and is 3' 30" north of it."

18 Dec 1884: NGC 2043, NGC 2072 and OGLE-CL LMC 632 (NGC 2059A)

These three LMC objects were discovered while observing a field of clusters that includes NGC 2046, 2047, 2057, 2058, 2059, 2065 and 2066. Albert Le Sueur, the first observer on the telescope, had previously sketched the field on 7 Feb 1870, as well as Joseph Turner on 26 Apr 1876. Lithographs of their sketches were published in "Observations of Southern Nebulae made with the Great Melbourne Telescope 1869 - 1885" (plate IV, figure 32 and figure 33). Baracchi added three new objects.

NGC 2043 was sketched and logged four nights later as "a small elongated group of minute stars in a very thin nebula". His sketch clearly identifies NGC 2043 as a N-S string of stars (asterism) at 05 35 33.7 -70 07 27 (J2000), a couple of arc minutes south of his computed position.

NGC 2072 was labeled "g" on his sketch and called "vvF, S, indistinct, flat." With respect to NGC 2065, he measured an offset of 47 seconds following and 40" N. This falls only 0.6' NE of center of this small cluster.

Baracchi's sketch also shows OGLE-CL LMC 632 (identified as NGC 2059A in SIMBAD) as a nebulous object close northwest of NGC 2059 and directly south of a star labeled as 15th magnitude. He called it "vvF, E, indistinct, flat, elongated." Ellery mentioned this object in "Observations…" but didn't include it with the two other "New Nebulae".

10 Feb 1885: S-L 692

Baracchi discovered this LMC cluster while re-observing the field of NGC 2107. He described it as "very small and very faint, irregular shape, roundish if anything." His sketch shows a nebulous object, which he measured as 64 seconds following and 1' 30" south of NGC 2107. This offset points directly to S-L 692, though he apparently missed slightly fainter S-L 691 just 0.8' north. He also computed positions for S-L 676 and S-L 684 that confirmed his discovery two months earlier on 11 December.

19-21 Mar 1885: NGC 4622A, 4650A, 4603A, 4603C, ESO 322-075, ESO 322-047, ESO 323-023

Over three nights Baracchi explored the core of the Centaurus Galaxy Cluster (AGC 4526). His target was NGC 4650 (= GC 3183) and NGC 4622 (= GC 3156), which Joseph Turner sketched in July of 1876. But in addition he documented 7 previously undiscovered galaxies, making accurate sketches and computing accurate positions.

On 19 March, NGC 4622A (labeled as number "2") was described as "pF; S; R; glbM; diam. 35 arcseconds." His sketch of 6 nearby stars is a perfect match, though he apparently missed the fainter member of this double system. NGC 4650A (labeled "4"), a spectacular polar ring galaxy, was logged as "vF; S; R; glbM." His sketch included four nearby stars that were accurately placed to the east. He called ESO 322-075 (labeled "5") "pB; S; R; gbM" and his sketch, as well as computed position, is an excellent match.

The next night he confirmed three additional galaxies with offsets measured from HD 110090 (a wide pair). NGC 4603A was called "F; S; R; diam 30"; vlbM", ESO 322-047 as "cF, vS, R, vlbM" and NGC 4603C as "pB; S; E; pmbM; 165°, 50" long and 15" broad". The first two galaxies were also sketched with respect to HD 110090.

He re-examined the field on the 21st of March to confirm the previous observations and picked up ESO 323-023. It was labeled "7" and timed at 3 min 2 sec following 6.9-magnitude HD 111403 and 4' north. His final constructed sketch shows 10 galaxies (the 7 described here and 3 previous discoveries by Herschel), along with one suspected nebula, which is a faint double star. His table includes very precise positions for all his discoveries.

9 Apr 1885: ESO 499-023

This galaxy was discovered while searching for NGC 3109. He described it as "pB; pS; R; very much brighter middle to a star-like nucleus." Baracchi's sketch with several nearby stars is a perfect match with ESO 499-023.

12 May 1885: ESO 322-102, 323-005, 323-008, 323-009, 323-019 and MCG -07-26-057,

Baracchi returned to the Centaurus cluster and discovered 6 additional galaxies. ESO 322-102 was found while observing nearby NGC 4696 and NGC 4709. He described it as "extremely faint, very small, irregular - perhaps a little elongated, flat [even surface brightness]. A star 12m precedes nebula by 18 seconds."

ESO 323-005 was called "pB; vS; R; pspmbM; 25" diameter." His sketch (labeled B) also includes ESO 323-008 (labeled C) and ESO 323-009 (labeled C'). ESO 323-008 was noted as "pF; S; R; vlbM; about 30" diameter. It is a little fainter than B." and ESO 323-009 as "eF; eS; [like a] small deformed star."

MCG -07-26-057, a close companion of NGC 4709, was labeled D' and described as "vvF; eS; R". He measured an offset of 3 seconds following NGC 4709 (labeled D) and 35" south. ESO 323-019 (labeled F) was noted as "pB; S; roundish; vlbM." He made field diagrams of all 6 new objects (as well as NGC 4677, 4706, 4709, 4743) that confirm the discoveries.

4 Jul 1885: ESO 322-099, ESO 322-100, NGC 4696A

While re-examining some of the 'nebulae' discovered on 12 and 13 May, Baracchi found three additional galaxies. ESO 322-099 (labeled M) was discovered 46 seconds preceding ESO 323-005 and 1' 30" north. His sketch of the field also includes ESO 322-100 (labeled N) less than 2' north.

Finally, he found NGC 4696A and NGC 4677 preceding NGC 4683. He placed NGC 4696A 45 seconds of RA west and 1' 50" north of NGC 4683. His field sketch confirms the identifications although he misidentified NGC 4677 (labeled O) as a new object. These last discoveries brought Baracchi's total to 17 galaxies discovered in the Centaurus cluster!

3 Sep 1885: IC 4982 and IC 4985

This pair of galaxies was discovered while searching for NGC 6872 and 6876 in the Pavo-I cluster. Baracchi's sketch, which perfectly matches the field, displays IC 4982 and IC 4985 as small round nebulae (labeled x and y) along with a half dozen field stars. He initially wrote, "Two nebula x and y (see diagram) were found in searching for [GC] 4354 etc. They are two extremely faint objects and I am not certain that they are nebulae at all. One (x) is more certain than (y) and I am pretty sure it is a nebula."

3 Oct 1885: NGC 6438A

Baracchi observed NGC 6438 on 3 Oct 1885 and described a "Double nebula or a small round pretty bright, [not legible], pmbM almost to a star like nucleus, with faint roundish flat appendage south following about 40" in diameter which might be a close companion to [NGC 6438]." He clearly sketched a double galaxy with a bright, small nebula on the NW side (NGC 6438) and a larger, fainter glow (NGC 6438A) attached on the SE edge. This interacting pair is within 5 degrees of the south celestial pole.

5 Oct 1885: 2MASX J20095889-4821262

While observing NGC 6868 (part of the Telescopium Group) Baracchi wrote, "[NGC 6868] has a small nebulous spark n.f. (see diagram). Faint, small, flat." His sketch accurately places this small galaxy close north of a 15th magnitude star, which he estimated at 16th magnitude.

***ESO 233-035*:** After describing NGC 6870 he wrote, "A very faint, very small flat nebulous patch precedes [NGC 6870] by 46 seconds and is 20" north of it. Called A in diagram." His small sketch shows 4 stars surrounding this object, including a mag 12 star 3' SSE, and perfectly matches the field of ESO 233-035.

***NGC 6861D*:** Baracchi next logged NGC 6861D as "another pF, very small, pmbM, roundish. Precedes [NGC 6870] by 111 seconds and is 4' 45" north of it. Called B." His diagram includes a nearby mag 10.5 star and two 15th mag stars, clinching the identification.

IC 4943 and 2MASX J20062917-4819434: Baracchi wrote these "two objects called D and C are both in the same declination and precede [NGC 6861] by 52 seconds and D is 40" south of [NGC 6861] and C is 3' 40" north of [NGC 6861]. C [= 2MASX …] is extremely faint, very very small, like a nebulous indistinct little patch. D [= IC 4943] is a little brighter than C but still pretty faint. It is very small, and gradually pmbM. Looks like a diffused faint nebulous star." His sketch, which includes a nearby mag 10.3 star along with several additional fainter stars, perfectly matches the field of these two galaxies.

2 Nov 1885: MCG -07-47-031

While observing the Grus Triplet, he logged "[NGC 7582] not found in the position given - found another small, faint indistinct object. F, S, vlbM, a little elongated in a direction [northwest]" Strangely enough the object does not correspond at all with [Herschel's] description, and is altogether out of position." His diagram points to MCG -07-47-031. In addition he placed a faint star close to its north and at this position is MCG -07-47-032. The observation was confirmed on 10 Nov. Baracchi's confusion was caused by Herschel's erroneous declination for NGC 7582 (15' too far north), coincidentally close to that of MCG -07-47-031.

8 Nov 1885: LEDA 2802343

Baracchi's diagram of NGC 6812 includes LEDA 2802343 as a very small nebulous object close WNW of NGC 6812. It appears to be labeled with an "n" (presumably an abbreviation for "nebula").

He described NGC 6812 as "Rather faint, small, pmbM. The center sparkling at times as if a star was in it." The last comment possibly refers to LEDA 2802344, which is attached on the southwest part of the halo, but there is no confirmation of this on his diagram.

5 Dec 1885: MCG -05-04-018, MCG -05-04-013 and LEDA 132859

Baracchi discovered these three galaxies during an observation of NGC 439 and 441. Nebula "A" was called "pB, vvS, R, lbM." His sketch confirms "A" as LEDA 132859 and shows it slightly elongated with a brighter nucleus. MCG -05-04-018 was labeled "D" and described as "Rather faint, extremely small, round, bM, like a nebulous star. A and D are like one another.

They are both extremely small." His sketch shows it slightly elongated E-W with a noticeably brighter elongated core. MCG -05-04-013 was plotted as a star but Baracchi commented, "This star suspected to be nebulous." MCG -05-04-012 was also included on his sketch as a star, though wasn't flagged as nebulous.

7 Dec 1885: IC 285

While making an observation of NGC 1200 (= GC 644), Baracchi also recorded three additional objects that he assumed were new. Two of these correspond with NGC 1195 and NGC 1196. The last object is IC 285, which he described as "almost as faint as A [NGC 1195] and as small, vvF, vvS. Indistinct outline. All four galaxies are accurately placed on his sketch. IC 285 was rediscovered by French astronomer Stephane Javelle in December 1893, and was credited with the discovery in the IC.

11 Dec 1885: ESO 297-012, LEDA 131053, LEDA 177545

Baracchi described NGC 633 as "Extraordinary - This is a double nebula. There are two distinct nebulae in the field pretty close to one another as shown in diagram - How is it that Herschel only has one?" The fainter companion, ESO 297-012, was described as "pB, vS, gbM. It is considerably fainter than the other and much fainter." In addition he also picked up nearby LEDA 131053 and reported, "vvF, very small, irregular, vslbM, almost flat insignificant patch. A star 12m following by 23 seconds and is 90" N of nebula."

Later the same night, he examined the field of NGC 1600 and picked up four objects, which he assumed were NGC 1600, 1601, 1603 and 1606. The nebula labeled "D" was described as "the fourth of group, faintest of all. Undefined irregular patch, small, very very little brighter middle. This follows A [NGC 1600] by 31 seconds and is 3' S of it." He assumed this object was NGC 1606, but his offsets point directly to LEDA 177545.

3-4 Jan 1886: S-L 556 = Hodge 4

Hodge 4 = S-L 556 was discovered while searching for GC 1153 [= NGC 1947], whose position was in error by 1 degree. Baracchi described Hodge 4 as "F; pL; Roundish; perhaps a little elongated in a direction following-preceding. vg vvlbM; Indistinct; ill-defined contour - about 75" broad and 90" long. A star 10 mag precedes nebula by 37 seconds and is 35" south of it. Another star 13 mag precedes nebula by 14s and is 25" north of it - No diagram." He determined an accurate position and confirmed the observation the next night.

28 Jan 1886: ESO 375-041 and LEDA 83082

These two galaxies were discovered while observing the core of the Antlia Cluster (ACO S636). ESO 375-041 (labeled "A") was described as "vF; S; R; flat" and LEDA 83082 (labeled as "C") as "vF; vS; flat; lE, 2 stars involved." The other objects he logged were NGC 3267 ("B"), NGC 3268 ("E"), NGC 3269 ("D") and NGC 3271 ("F"). He remarked the "night not first class. Some haze here and there. Then very dewy." But his observations were confirmed on 8 Feb 1886 and his computed positions match perfectly.

3 Feb 1886: ESO 501-049, PGC 31444, PGC 31450, PGC 31476 and LEDA 141475

While observing the core of the Hydra I cluster (Abell 1060), Baracchi recorded 11 galaxies, five of which were new discoveries. He also logged the six members discovered earlier by John Herschel (NGC 3307, 3308, 3309, 3311, 3312 and 3316). His sketch and derived positions positively identify all of these galaxies.

He described the five new objects as follows: ESO 501-049 ("vvF, vS, R, gbM"), PGC 31444 ("eeF, S, R, uncertain"), PGC 31450 ("vvF, vS, flat, roundish"), PGC 31476 ("vvF, vS, R, *12 p"), LEDA 141475 ("eeF, a minute nebulous star"). He reexamined the cluster on 8 February and confirmed the new objects.

8 Feb 1886: IC 2584, NGC 3258B and LEDA 83097

Baracchi returned to the Antlia Cluster and picked up IC 2584. He labeled it "S" on his sketch and called it "pF; L; E; gbM, narrow. This precedes [NGC 3281] by 121 seconds and is 3' 40" S of it." He added the comment "The nebula S is very probably new [underlined]." The observation was confirmed on 1 Mar 1886.

He then moved about 40' further south and recorded NGC 3257, 3258, 3260 and 3273. In addition he discovered NGC 3258B and LEDA 83097. He described NGC 3258B (object "Q") as "vvF, small, flat, indistinct contour" and placed it 2' 20" north of NGC 3258 and 92 seconds of RA following. LEDA 83097 (a surprisingly faint galaxy labeled with a question mark) was described as "eeF, small, uncertain." His offset was 20" south of NGC 3258 and 52 seconds of RA following.

28 Feb 1886: NGC 3258D

Once again, back to the Antlia cluster he retimed the transits of NGC 3267, 3268 and 3271. In addition he found "a nebula F, S, R, vlbM, ill defined outline follows F [NGC 3271] by 89 seconds and is 3' south of it. It has a star 15m close preceding and one a little further away but still very near north following." His offset and description clearly applies to NGC 3258D. He confirmed the observation the next night. NGC 3258D was his sixth galaxy discovered in the cluster.

10 Mar 1886: PGC 31418

Baracchi reexamined the Hydra I cluster and found the "previous observations quite correct." In addition he noted, "there is a very minute star which looks like a little nebulous speck. This precedes "C" [NGC 3308] by 15 seconds and is 60" S of it. Uncertain. A star 14m precedes this nebulous star by 4 seconds and is 5" south of it." His offsets point directly to this small and faint galaxy. PGC 31418 was the 6th galaxy discovered by Baracchi in the cluster. Just a week after this observation he contracted typhoid fever and his observations were suspended for the following 8 months.

7/8 Dec 1887: ESO 194-013

In November 1887, the primary mirror A of the telescope, which had been in use since 1870, was removed and the spare mirror B was installed. Baracchi wrote "the figure of this spare mirror was tested by observing the image of a watch dial, and seems pretty poor all over the speculum. All there seems to be little gain in light. The faint objects of Herschel are here considerably faint, instead of being pretty bright, as they should be – you can't focus a star properly." Nevertheless, he discovered a few objects after this date.

While observing the NGC 87/88/89/92 quartet he noticed a nebula described as "pF; pL; R; flat; about 35" diameter; ill defined. It follows GC 46 [NGC 92] by 68s and is 2' 40" north of it. This nebula is not in the General Catalog. Probably new." The sighting was confirmed the following night and he estimated a diameter of 40".

16/17 Dec 1887: Bruck 67, Kron 25 and Henize SMC-N45 (LHα-N45)

On these two nights Baracchi carefully worked across the SMC starting at NGC 220 and picked up NGC 222, 231, 242 (logged separately as two parts oriented NW and SE), 248 (also logged as two parts NW and SE), 256, 265, 267, 269 and 294. Offsets were carefully measured with respect to each other, so the identifications are very easy to match.

In addition he picked up three new objects. Bruck 67 (00h 52m 48.4s -73° 24' 41") was labeled as object "M" and described as "eeF; pL; R; vlbM". His offset was 18 seconds of RA preceding and 2' S of NGC 294.

Kron 25 (00h 48m 02s -73° 29' 12") was labeled as object "K" and called "eeF; S; irr; roundish - ill defined." His offset with respect to the position of NGC 269 was –21 seconds of time and +2' 40" in declination.

Finally, Henize SMC-N45 was found "90 seconds preceding object "N" [NGC 294] and 9' north of it." His description reads " a small group of minute stars involved in very faint nebulosity. This is probably [GC 166 = NGC 294]." The last statement is incorrect as object "N" in his list clearly refers to NGC 294. He was perhaps confused as its RA is 1 minute too small in the GC.

14 Feb 1888: ESO 358-059

This galaxy was discovered while searching unsuccessfully for NGC 1436 (a duplicate of NGC 1437). He wrote, "Searched for H. 769 [sic GC 769 = NGC 1436] - not found - Found a nebula vF; S; R; vgM. This is called in diagram H. 770? [NGC 1437] but I hardly think it can be it." After correctly identifying NGC 1437 he placed the new nebula 1 min 29 seconds following and 6' S and confirmed the observation the following night.

In April 1888 all observations ceased with the GMT and re-polishing experiments commenced. Baracchi finally succeeded in getting a good figure and polish on Mirror A and it was replaced in the telescope in 1890. But only a limited number of scattered observations were made subsequently; Eta Car was observed a few times, along with a few nebulae and comets, but there were no new discoveries.

Additional Objects

In additional to these 59 objects (57 uncredited), Baracchi also recorded the following objects:

4 Dec 1885: Two HII knots in NGC 1313

Baracchi made a fairly detailed observation of the barred spiral NGC 1313 and mentioned "Another extremely faint, pretty large, round flat object south-preceding [NGC 1313]. I believe this is a new nebula." His sketch includes this object as a diffuse patch labeled as "New?" on the southwest side. At his position is the HII complex [PES80] 8, which is situated between the central part of the galaxy and a mag 10 star 7.6' SW of center. [PES80] 1 is also shown on the sketch as a brighter patch on the northeast end of the galaxy. These HII designations are from a 1980 study by Page, Edmunds and Smith in MNRAS, 193, 219.

5 Dec 1885: MCG -05-04-012

His sketch of the NGC 439/441 field includes this galaxy as a star, though it is not mentioned as nebulous.

24 Jun 1884: Hodge 301 in NGC 2070

Baracchi clearly included the compact open cluster Hodge 301, situated 3' northwest of the center of the Tarantula Nebula, in a sketch made on 24 Jun 1884. He didn't describe this cluster, only noting how prominent the central cluster (R136) appeared.

Hodge 301 in the Tarantula Nebula (Credit: HST image from NASA/ESA).

Data and visual observations

ESO 194-013 = PGC 1452

00 22 38.1 -48 34 52; Phoenix
V = 13.6; Size 1.1'x1.0'; Surf Br = 13.6; PA = 47°

30" (11/4/10 - OzSky, 429x): picked up while viewing the compact Phoenix Quartet located ~12' WSW and part of the same group. At 429x, appeared moderately bright, moderately large, elongated 4:3 SW-NE, 0.9'x0.7', broad concentration with a slightly brighter core but no distinct zones. A distinctive string of three mag 13 stars [length 1.4'] is centered 2' E.

Kron 25 = Lindsay 35 = OGLE-CL SMC 45

00 48 02 -73 29 12; Tucana
SMC OC; V = 14.0; Size 1.0'

25" (10/17/17 - OzSky): at 244x and 397x; fairly faint, irregular glow, ~35" diameter, low surface brightness. Situated 3' NNW of NGC 269 and 3.6' E of NGC 265. A mag 8.5 star is 5.8' E.

SMC-N45 = OGLE-CL SMC 72
00 51 41.7 -73 13 46; Tucana
SMC: Cluster + Emission Nebula

25" (10/17/17 - OzSky): at 397x; bright, moderately large, irregular or triangular in shape, 35"-40" diameter. Several very faint stars are superimposed or at the edges of the glow including a couple of mag 15 stars at the south edge and a couple of mag 15.5 stars at the east edge. Two mag 13/14 stars are 0.8' SE. Located 4.5' SE of NGC 290 in the central part of the SMC.

18" (7/10/05 - Magellan Observatory): picked up while viewing NGC 290 at 228x. This SMC HII region (and cluster) appeared as a faint, elongated patch with a few faint stars resolved around the edges (part of Hodge Association 26). I didn't try blinking with a UHC filter.

Bruck 67 = DEM S 73
00 52 48.4 -73 24 41; Tucana
SMC OC; V = 13.4; Size 0.8'

25" (10/17/17 - OzSky): at 244x and 397x; faint, fairly small, irregular low surface brightness patch, 35" diameter. Located just 2.2' SSW of much brighter NGC 294.

30" (11/6/10 - OzSky, 264x): picked up 2.2' SSW of NGC 294. This cluster appeared as slightly smaller, irregular glow with a low even surface brightness.

MCG -05-04-012 = PGC 4413
01 13 27.9 -31 49 01; Sculptor
V = 15.3; Size 0.5'x0.3'; Surf Br = 13.1; PA = 133°

24" (9/15/12): extremely faint, very small, round, 18" diameter. In a small trio of faint galaxies 5' SW of NGC 439 within ACO S141. MCG -05-04-013 is 1.1' NE and MCG -05-04-011 is 1.4' N.

MCG -05-04-013 = PGC 4412
01 13 32.5 -31 48 25; Sculptor
V = 14.9; Size 0.4'x0.4'; Surf Br = 12.9

24" (9/15/12): very faint, very small, round, 18" diameter. In a small trio of faint galaxies 5' SW of NGC 439 within ACO S141. Partially due to the low elevation and only fair seeing, it was very difficult only one or two galaxies could be glimpsed at a time, though this one was slightly easier.

LEDA 132859 = 2MASX J01134317-3150350
01 13 43.2 -31 50 35; Sculptor
Size 0.7'x0.55'; PA = 96°

24" (9/15/12): fourth brightest member in the cluster ACO S141 = SCG 1 = Klemola 1. Appeared faint, small, oval 4:3 ~E-W, ~0.4'x0.3', even surface brightness. Located 3.7' SW of NGC 441.

MCG -05-04-018 = PGC 4452
01 14 11.0 -31 49 38; Sculptor
V = 14.1; Size 0.7'x0.5'; Surf Br = 13.1; PA = 102°

24" (9/15/12): third brightest member in the cluster ACO S141 = Klemola 1. Appeared fairly faint, fairly small, oval 3:2 E-W, 24"x16". Located 7' SE of NGC 439, the brightest in the group.

LEDA 131053 = 2MASX J01343865-3721133
01 34 38.7 -37 21 13; Sculptor
Size 0.6'x0.4'; PA = 120°

ESO 297-012 = MCG -06-04-057 = PGC 5959
01 36 24.2 -37 20 26; Sculptor
Size 0.7'x0.35'; PA = 2°

IC 285 = MCG -02-08-044 = PGC 11557
03 04 06.2 -12 00 56; Eridanus
Size 1.1'x0.2'; PA = 117°

24" (12/6/18): at 375x; nearly fairly faint, fairly small, elongated at least 2:1 NW-SE, low even surface brightness, ~40"x18". Located 3.2' SE of NGC 1200 in a distinctive quartet. The major axis of the galaxy points to the center of NGC 1200.

ESO 358-059 = MCG -06-09-026 = PGC 13753
03 45 03.6 -35 58 21; Eridanus
V = 13.1; Size 1.0'x0.8'; Surf Br = 12.6; PA = 155°

LEDA 177545
04 32 10.4 -05 08 12; Eridanus
Size 0.4'x0.25'; PA = 91°

S-L 92 = KMHK 240
04 54 26.5 -68 14 51; Dorado
LMC OC; V = 14.5

Hodge 4 = S-L 556 = ESO 086-009
05 32 25.4 -64 44 11; Dorado
LMC OC; V = 13.3; Size 2.0'

NGC 2043
05 35 33.7 -70 07 27; Mensa
N-S string of stars (asterism)

OGLE-CL LMC 632

05 36 53.7 -70 06 21; Mensa
LMC OC

24" (4/10/08 - Magellan Observatory): I confirmed there was a cluster in the position I plotted just off the edge of the Mati Morel Atlas. At 260x it appeared faint, small, 20"-25" diameter and seems mottled like a group of stars (on the DSS this is a small incomplete ring of stars). There is a single star just off the (SE) edge. This chain of stars is misidentified as NGC 2059 on the Hodge-Wright Atlas.

24" (4/9/08 - Magellan Observatory): at 260x, this unidentified cluster appeared fairly faint, fairly small, round, 25" diameter. A very faint star is at the edge. Located 1.5' NW of NGC 2059 and 3.5' N of NGC 2058). It forms the northern vertex of a near equilateral triangle with two mag 12 stars ~1.5' SSE and SW.

Hodge 301 = H88 301
05 38 17 -69 04 02; Dorado
LMC OC; V = 10.9; Size 0.5'

18" (7/8/02 - Magellan Observatory): this compact cluster is situated just 3' NW of the central cluster (R136) of the Tarantula Nebula. It appeared as a 30" knot with a half-dozen mag 13-14 stars resolved over haze.

NGC 2072 = ESO 057-004 = S-L 630
05 38 23.8 -70 14 01; Mensa
LMC OC; V = 13.2; Size 1.0'

24" (4/10/08 - Magellan Observatory): at 260x this LMC cluster appeared moderately bright, fairly small, round, 35"-40" diameter, weak concentration. Located 4' E of NGC 2065 at the east end of a group of 8 NGC clusters (and a couple of fainter ones).

S-L 676
05 43 09 -70 34 19; Mensa
LMC OC; V = 13.0; Size 0.8'

30" (10/13/15 - OzSky): at 394x; moderately bright and large, round, 35" diameter, smooth glow with no resolution. S-L 684 is 2.4' ENE. Picked up 4.1' NNW of NGC 2107.

S-L 684
05 43 38 -70 33 58; Mensa
LMC OC; Size 0.6'

30" (10/13/15 - OzSky): at 394x; fairly faint to moderately bright, smooth glow, 25" diameter, roundish, no resolution. Brighter S-L 676 lies 2.4' WSW. Picked up 5' NNE of NGC 2107.

S-L 692
05 44 14.5 -70 40 09; Mensa
LMC OC; Size 0.7'

30" (10/13/15 - OzSky): at 394x; fairly faint, fairly small, slightly elongated glow, 35" diameter, no resolution. S-L 692 is the southern of close pair of LMC clusters with S-L 691 just 48" N. Located 5.4' ESE of NGC 2107.

ESO 499-023 = MCG -04-24-007 = PGC 28690
09 56 25.6 -26 05 42; Hydra
V = 11.7; Size 2.1'x1.2'; Surf Br = 12.6; PA = 109°

ESO 375-041 = MCG -06-23-035 = PGC 30905
10 29 31.0 -35 15 36; Antlia Cluster (ACO S636)
V = 13.6; Size 1.3'x0.3'; PA = 147°

LEDA 83097
10 29 45.4 -35 37 03; Antlia Cluster (ACO S636)
Size 0.4'x0.3'; PA = 15°

LEDA 83082
10 29 48.4 -35 25 08; Antlia Cluster (ACO S636)
Size 0.8'x0.4'; PA = 146°

IC 2584 = ESO 375-043 = MCG -06-23-037 = PGC 30938
10 29 51.5 -34 54 42; Antlia Cluster (ACO S636)
V = 12.7; Size 2.0'x0.4'; PA = 133°

NGC 3258B = LEDA 83128
10 30 25.3 -35 33 49; Antlia Cluster (ACO S636)
Size 1.0'x0.3'; PA = 47°

NGC 3258D = ESO 375-058 = MCG -06-23-051 = PGC 31094
10 31 55.6 -35 24 36; Antlia
V = 13.2; Size 1.6'x0.9'; Surf Br = 13.4; PA = 5°

17.5" (3/28/87): fairly faint, fairly large, diffuse. A star is at the west edge. Located 18' ESE of NGC 3271 in the Antlia Cluster.

PGC 31418 = PGC 31419
10 36 11.0 -27 27 15; Hydra I cluster (Abell 1060)
Size 0.6'x0.3'; PA = 80°

PGC 31444
10 36 24.9 -27 34 55; Hydra I cluster (Abell 1060)
Size 0.6'x0.5'

PGC 31450
10 36 29.1 -27 29 02; Hydra
Size 0.7'x0.4'; PA = 148°

48" (4/21/17): at 488x; fairly faint, fairly small, elongated 4:3 NW-SE, ~18"x14", small bright nucleus. Located 2.5' NW of NGC 3309 in AGC 1060. First in a quartet of relatively faint and small galaxies just north of NGC 3309/3311 in the Hydra I cluster (Abell 1060) with PGC 31464 1.3' ENE.

LEDA 141475
10 36 29.2 -27 23 37; Hydra I cluster (Abell 1060)
Size 0.5'x0.5'

PGC 31476
10 36 41.2 -27 33 40; Hydra
Size 0.8'x0.3'; PA = 123°

48" (4/21/17): at 488x; fairly faint, fairly small, elongated 5:2 or 3:1 NW-SE, ~25"x9". Located 2' S of NGC 3311 in AGC 1060 and fairly close east [32"] of a mag 11 star. A mag 15.8 is squeezed between this galaxy and the mag 11 star [15" W of center].

ESO 501-049 = AM 1035-271A = PGC 31542
10 37 20.1 -27 33 36; Hydra
V = 14.3; Size 0.9'x0.3'; Surf Br = 12.5; PA = 167°

48" (4/21/17): at 488x; moderately bright, fairly small, elongated 5:2 ~N-S, ~50"x20", contains a small bright core and stellar nucleus. Situated 3.9' due east of NGC 3312. AM 1035-271A NED02, a disrupted pair or ring galaxy, is 1' NE. Due to an extremely low surface brightness, it required averted to glimpse.

24" (3/28/17): faint to fairly faint, very small, slightly elongated N-S, 15"x10", faint stellar nucleus. Located 3.9' E of NGC 3312 in the core of AGC 1060. A mag 10.8 star is 1.5' SW and several fainter stars are nearby. I'm surprised I noticed this galaxy through my 18" in 2005.

18" (4/9/05): this extremely faint member of AGC 1060 was just glimpsed a few times and sketched while observing other brighter members of the cluster. Checking the DSS, showed this galaxy exactly where I had placed it with respect to a trio of stars to the SW. Located 4' E of NGC 3312 in the core of AGC 1060.

NGC 4603A = ESO 322-044 = MCG -07-26-020 = PGC 42369
12 39 36.9 -40 44 24; Centaurus
V = 13.5; Size 1.9'x0.6'; Surf Br = 13.6; PA = 90°

17.5" (4/7/89): very faint, elongated E-W. Located 4.7' W of a bright unequal double star mag 9/13 at 23". Member of the Centaurus cluster (Abell 3526).

ESO 322-047 = MCG -07-26-023 = PGC 42441
12 40 18.1 -40 45 43; Centaurus Cluster (Abell 3526)
Size 0.9'x0.6; PA = 75°

NGC 4603C = ESO 322-049 = MCG -07-26-025 = PGC 42486

12 40 43.1 -40 45 48; Centaurus Cluster (Abell 3526)
Size 1.8'x0.4'; PA = 162°

NGC 4622A = ESO 322-64 = MCG -07-26-035/036 = VV 580 = PGC 42845
12 43 49.1 -40 42 53; Centaurus
V = 13.5; Size 0.6'x0.5'; Surf Br = 12.1; PA = 117°

17.5" (4/7/89): very faint, very small, round. Two mag 13 stars at 50" separation oriented E-W follow (the closest is 1.2' SE of center). Forms a pair with NGC 4650 5.8' ESE. This is a double galaxy (with NGC 4622B) and a member of the Centaurus cluster (AGC 3526).

NGC 4650A = ESO 322-069 = AM 1242-402 = PGC 42951
12 44 49.1 -40 42 51; Centaurus
V = 13.3; Size 1.6'x0.8'; Surf Br = 13.4; PA = 158°

48" (4/21/17): at 488x; nearly moderately bright, fairly small, oval 4:3 or 3:2 WSW-ESE, small brighter core. The polar ring extensions were extremely faint and difficult, though viewed in windy conditions.

48" (5/15/12): moderately bright, fairly small, oval 3:2 WSW-ESE, 24"x16". The polar ring was occasionally visible as faint, thin extensions oriented NNW-SSE. Need to reobserve as viewed through thin clouds.

24" (4/12/08 - Magellan Observatory): this is a classic polar-ring galaxy in Centaurus cluster AGC 3526 (one of about a 100 known), located 5.6' ENE of NGC 4650. The polar-ring is the result of the collision and merger of two galaxies at least 1 billion years ago. At 200x, it appeared fairly faint, fairly small, elongated 3:2 WSW-ENW, 30"x20". The surrounding "polar-ring" was not recorded.

Polar Ring Galaxy NGC 4650A Credit: Hubble Heritage Team (AURA/STScI/NASA/ESA)

ESO 322-075 = MCG -07-26-042 = PGC 43087
12 46 26.0 -40 45 09; Centaurus Cluster (Abell 3526)
Size 1.5'x0.9'; PA = 93°

NGC 4696A = ESO 322-077 = MCG -07-26-043 = PGC 43120
12 46 55.6 -41 29 48; Centaurus
V = 13.7; Size 1.4'x0.5'; Surf Br = 13.2; PA = 174°

18" (7/7/05 - Magellan Observatory): faint, fairly small, elongated 5:2 N-S. Appears like a low surface brightness version of NGC 4677, which was viewed immediately before. Located 5.1' N of NGC 4677 and 9' WNW of NGC 4683 in the core of the Centaurus Cluster (AGC 3526).

ESO 322-099 = PGC 43354
12 49 26.2 -41 29 22; Centaurus
V = 13.3; Size 1.1'x0.7'; Surf Br = 12.9; PA = 176°

18" (7/7/05 - Magellan Observatory): fairly faint, very small, round, only 20" diameter but has a fairly high surface brightness. Paired with ESO 322-100 just 1.5' N. A mag 10.3 star lies 3.2' SW. Located 13' SE of NGC 4696 in the core of the Centaurus Cluster (AGC 3526).

ESO 322-100 = PGC 43355
12 49 26.6 -41 27 47; Centaurus
V = 13.7; Size 1.0'x0.4'; Surf Br = 12.5; PA = 88°

18" (7/7/05 - Magellan Observatory): faint, very small, round, 20" diameter and weak concentration. A mag 14.5-15 star is close following. With averted vision the core has faint extensions E-W roughly in the direction of faint star increasing the overall size to 30"x20". Forms a close pair with ESO 322-99 just 1.5' S. Located 11' SE of NGC 4696 and 8.5' SW of NGC 4709 in the core of the Centaurus Cluster (AGC 3526).

ESO 322-102 = MCG -07-26-054 = PGC 43374
12 49 37.7 -41 23 19; Centaurus
V = 13.8; Size 1.3'x0.3'; Surf Br = 12.7; PA = 45°

18" (7/7/05 - Magellan Observatory): faint, fairly small, very elongated 3:1 SW-NE, 0.6'x0.2', very weak concentration. Located 5' W of NGC 4709 and 10' SE of NGC 4696 in the core of the Centaurus Cluster (AGC 3526).

MCG -07-26-057 = PGC 43427
12 50 07.7 -41 23 53; Centaurus Cluster (Abell 3526)
V = 14.0; Size 0.5'x0.4'

ESO 323-005 = MCG -07-26-058 = PGC 43435
12 50 12.2 -41 30 55; Centaurus
V = 13.1; Size 1.2'x0.5'; Surf Br = 12.7; PA = 9°

18" (7/7/05 - Magellan Observatory): fairly faint, very small, oval 3:2 N-S, 0.4'x0.25', fairly high surface brightness. A mag 13 star lies 0.9' SW of center. Located 8' S of NGC 4709 and 20' SE of NGC 4696 in the core of the Centaurus Cluster (AGC 3526). Two galaxies, ESO 323-008 and 323-009 lie 5' and 7.5' NE, respectively.

ESO 323-008 = PGC 43466
12 50 34.4 -41 28 17; Centaurus
Size 1.0'x0.3'; PA = 142°

18" (7/7/05 - Magellan Observatory): faint, small, elongated 2:1 NW-SE, 0.5'x0.25', weak or no concentration. A mag 10.8 star lies 2.3' NE. Second of three in a chain with ESO 323-005 5' SW and ESO 323-009 2.8' NNE. Located 8' SE of NGC 4709 and 22' SE of NGC 4696 in the core of the Centaurus Cluster (AGC 3526).

ESO 323-009 = PGC 43479
12 50 43.0 -41 25 50; Centaurus
Size 1.1'x0.5'; PA = 82°

18" (7/7/05 - Magellan Observatory): very faint, very small, slightly elongated E-W, 0.4'x0.3'. Located 1' N of a mag 10.8 star that forms a wide, unequal pair with a mag 14 star at 18" separation. ESO 323-008 lies 2.8' SW. Located 8' SE of NGC 4709 and 22' SE of NGC 4696 (on a line with both galaxies) in the core of the Centaurus Cluster.

ESO 323-019 = MCG -07-27-004 = PGC 43623
12 52 03.1 -41 27 36; Centaurus Cluster (Abell 3526)
Size 1.5'x0.7'; PA = 96°

ESO 323-023 = MCG -07-27-007 = PGC 43677
12 52 26.0 -40 42 27; Centaurus Cluster (Abell 3526)
Size 1.2'x0.8'; PA = 18°

NGC 6438A = ESO 010-001 = VV 682 = PGC 61793
18 22 35.5 -85 24 23; Octans
V = 11.8; Size 2.7'x1.0'; Surf Br = 12.7; PA = 32°

24" (4/11/08 - Magellan Observatory): this is the eastern component of an disrupted, interacting system with NGC 6438. At 260x it appeared as a faint, diffuse, elongated SW-NE glow attached on the east side of NGC 6438, ~0.8'x0.5'. The DSS reveals two disturbed arms (possibly separate galaxies), though I didn't distinguish these separately. A mag 9.5 star lies 4' SW.

LEDA 2802343
19 45 12.0 -55 20 27; Telescopium
Size 0.6'x0.3'; PA = 51°

25" (4/5/16 - OzSky, 318x): LEDA 2802343 is the second brightest of two faint companions to NGC 6812 and was seen without difficulty just 1.8' WNW. It appeared very faint and small, round, ~12" diameter.

IC 4943 = ESO 233-028 = PGC 64102
20 06 28.2 -48 22 33; Telescopium
V = 12.7; Size 1.5'x1.1'; Surf Br = 13.3; PA = 38°

18" (7/10/02 - Magellan Observatory): At 128x, this member of the Telescopium Group = ACO S851 appeared faint, small, round, 25" diameter. A mag 12.8 star lies 0.9' N of center. Located 8.5' W of NGC 6861 (second brightest of four in field). Forms the southern vertex of a triangle with an extremely faint anonymous galaxy (2MASX J20062917-4819434) 2.8' N and a mag 10 star 3.8' NE.

2MASX J20062917-4819434 = LEDA 3917583
20 06 29.1 -48 19 43; Telescopium
Size 0.5'x0.4'

18" (7/10/02 - Magellan Observatory): At 128x, while viewing the field of NGC 6861 in the Telescopium Group = ACO S851, I picked up a very small anonymous galaxy just 2.8' N of IC 4943. It appeared extremely faint, round, perhaps 20" diameter and formed the northern vertex of a triangle with IC 4943 2.8' S and a mag 10.3 star 3.4' ESE.

NGC 6861D = ESO 233-034 = PGC 64153
20 08 19.5 -48 12 41; Telescopium
V = 12.4; Size 2.3'x0.7'; Surf Br = 12.8; PA = 154°

30" (10/18/17 - OzSky): at 264x and 429x; fairly bright, fairly large, very elongated 3:1 NNW-SSE, ~1.6'x0.5', strong concentration with a very bright elongated core and a stellar nucleus. A mag 10.4 star is 1.2' W. NGC 6861 lies 13.5' SW and NGC 6868 is 18.5' SE.

ESO 233-035 = PGC 64179
20 09 25.6 -48 17 04; Telescopium
V = 13.3; Size 1.0'x0.4'; Surf Br = 12.2; PA = 149°

18" (7/10/02 - Magellan Observatory): this member of the Telescopium Group was fairly faint, small, elongated NW-SE, 0.5'x0.3' with a small bright core. Forms the NW vertex of a near equilateral triangle with NGC 6868 7' SE and NGC 6870 7.5' E within the central core of the Telescopium Group. A mag 10.6 star lies 6' W.

2MASX J20095889-4821262 = LEDA 3918606
20 09 58.9 -48 21 26; Telescopium

30" (10/18/17 - OzSky): at 429x; fairly faint to moderately bright, round, 20" diameter, weak concentration, with a fairly high surface brightness. This galaxy is just off the northeast edge of NGC 6868 [1.6' from center], the dominant galaxy at the core of the Telescopium Group.

IC 4982 = ESO 073-039 = PGC 64498
20 20 20.8 -71 00 28; Pavo
Size 0.6'x0.2'; PA = 50°

30" (10/18/17 - OzSky): at 429x; faint to fairly faint, slightly elongated SW-NE, 20"x15". A close (interacting) companion (LEDA 270900) off the south edge was not noticed. Slightly fainter of a pair with IC 4985 2.3' NE.

IC 4985 = ESO 073-040 = PGC 64505

20 20 44.0 -70 59 13; Pavo
V = 13.9; Size 0.9'x0.6'; Surf Br = 12.9; PA = 66°

30" (10/18/17 - OzSky): at 429x; fairly faint, fairly small, round, broad concentration. Slightly brighter of a pair with IC 4982 2.3' SW. Member of the Pavo-I Group.

MCG -07-47-031 = PGC 71043
23 19 05.9 -42 06 48; near Grus Triplet
Size 0.5'x0.5'