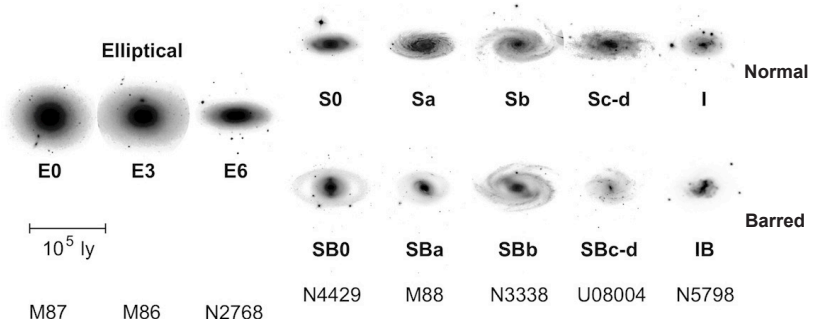
GALAXIES: BRIGHTEST AND NEAREST

BY BARRY F. MADORE AND IAN STEER

External galaxies are generally of such low surface brightness that they often prove disappointing objects for the amateur observer. However, it must be remembered that many of these galaxies were discovered with very small telescopes and that the enjoyment of their discovery can be recaptured. In addition, the central concentration of light varies from galaxy to galaxy, making a visual classification of the types possible at the telescope. Indeed, the *Hubble galaxy classification* (**Type**) given in Table 1 (facing page) is in part based on the fraction of light coming from the central bulge of the galaxy as compared to the contribution from a disk component. Disk galaxies with dominant bulges are classified as **Sa**; as the nuclear contribution declines, types of **Sb**, **Sc**, and **Sd** are assigned until the nucleus is absent at type **Sm**. Often the disks of these galaxies show spiral symmetry, the coherence and strength of which is denoted by Roman numerals **I** through **V**, smaller numbers indicating well-formed global spiral patterns. Those spirals with central bars are designated **SB**, while those with only a hint of a disk embedded in the bulge are called **S0**. A separate class of galaxies that possess no disk component are called ellipticals and can only be further classified numerically by their apparent flattening, with **E0** being apparently round and **E7** being the most flattened.

Environment appears to play an important role in determining the types of galaxies we see at the present epoch. Rich clusters of galaxies, such as the system in Coma, are dominated by ellipticals and gas-free S0 galaxies. The less dense clusters and groups tend to be dominated by the spiral, disk galaxies. Remarkably, pairs of galaxies are much more frequently of the same Hubble type than random selection would predict. Encounters between disk galaxies may in some cases result in the instabilities necessary to form the spiral structure we often see. M51 (the Whirlpool) and its companion, NGC 5195, are an often-cited example of this type of interaction. In the past, when the Universe was much more densely packed, interactions and collisions may have been sufficiently frequent that entire galaxies merged to form a single large new system; it has been suggested that some elliptical galaxies formed in this way.

Table 1 on the facing page lists the 40 brightest galaxies taken from the *Revised Shapley-Ames Catalog*. As well as their designations, positions, and types, the table lists the total blue magnitudes, major and minor axis lengths (to the nearest minute of arc), the latest estimate of their distances in 10^6 ly, and their radial velocities corrected for the motion of our Sun about the galactic centre. Although the Universe as a whole is in expansion, there are parts that are still bound together (or at the very least,



"Tuning fork" diagram of galaxy classification. Actual galaxy images are used, with the Messier or NGC numbers indicated at the bottom. (Diagram created by Ian Steer.)

held back in their expansion) by gravity. These groups and clusters are, in essence, representative of the largest material structures in the Universe. Recently, large-scale flows of material have been reported, far in excess of the velocities expected due to the perturbing presence of other galaxies and clusters of galaxies. Either there are exceedingly large concentrations of matter yet to be discovered just beyond our limited view of the world, or the Universe has had a much more interesting history than our present theories indicate. The brightest and nearest galaxies in Table 1 may be moving not only as a result of the universal expansion, but also through very complex interactions with distant parts as yet only postulated but not seen. A selection of nearest galaxies, listed on the following page in Table 2, form what is known as the Local Group of Galaxies. **(Both tables are significantly updated for 2013.)**

TABLE 1—THE 40 OPTICALLY BRIGHTEST SHAPLEY-AMES GALAXIES

		RA (2000) **Dec**			**Magnitude**	**Size**	**Distance**	**Rad. Vel.**
NGC	**Other**	h m	° ′	**Type**	B_T	′	10^6 ly	km/s
55		0 14.9	–39 11.8	SBm	8.66	32 × 6	6.32	129
205	M110	0 40.4	+41 41.1	E5 pec	9.08	22 × 11	2.61	–241
221	M32	0 42.7	+40 51.9	E2	9.16	9 × 7	2.51	–200
224	M31	0 42.7	+41 16.2	Sb I–II	4.16	190 × 60	2.58	–300
247		0 47.1	–20 45.6	Sd III–IV	9.72	21 × 7	11.7	156
253		0 47.6	–25 17.3	Sc	8.27	28 × 7	10.2	243
SMC		0 52.7	–72 49.7	SBm IV–V pec	2.28	320 × 185	0.196	158
300		0 54.9	–37 41.1	Sd III	8.77	22 × 16	6.42	144
598	M33	1 33.8	+30 39.6	Scd II–III	6.29	71 × 42	2.87	–179
628	M74	1 36.7	+15 47.0	Sc I	10.01	11 × 10	29.6	657
1068	M77	2 42.7	–00 00.8	Sb II	9.67	7 × 6	44.0	1137
1291		3 17.3	–41 06.5	SB0/a	9.44	10 × 8	28.0	839
1313		3 18.3	–66 29.9	SBd III–IV	9.70	9 × 7	12.9	470
1316	Fornax A	3 22.7	–37 12.5	S0 pec	9.44	12 × 9	65.6	1760
LMC		5 23.6	–69 45.4	SBm III	0.57	645 × 550	0.163	278
2403		7 36.9	+65 36.2	Scd III	9.12	22 × 12	11.7	131
2903		9 32.2	+21 30.1	Sbc I–III	9.59	13 × 6	29.5	556
3031	M81	9 55.6	+69 03.9	Sab I–II	7.96	27 × 14	12.0	–34
3034	M82	9 55.9	+69 40.8	I0	9.25	11 × 4	12.3	203
3521		11 05.8	–00 02.2	Sbc II–III	9.85	11 × 5	39.4	801
3627	M66	11 20.3	+12 59.5	Sb II	9.56	9 × 4	32.6	727
4258	M106	12 19.0	+47 18.2	Sbc II	9.29	19 × 7	24.3	448
4449		12 28.2	+44 05.6	IBm IV	10.18	6 × 4	12.0	207
4472	M49	12 29.8	+08 00.0	E2	9.30	10 × 8	52.2	997
4486	M87	12 30.8	+12 23.5	E0	9.65	8 × 7	54.9	1307
4594	M104	12 40.0	–11 37.4	Sa	8.56	9 × 4	33.9	1024
4631		12 42.1	+32 32.5	Sd	9.63	16 × 3	19.7	606
4649	M60	12 43.7	+11 33.2	E	9.66	7 × 6	53.0	1117
4736	M94	12 50.9	+41 07.2	Sab	8.69	11 × 9	16.7	308
4826	M64	12 56.7	+21 41.0	Sab II	9.08	10 × 5	17.4	408
4945		13 05.5	–49 28.1	Scd	9.37	20 × 4	13.0	563
5055	M63	13 15.8	+42 01.8	Sbc II–III	9.57	13 × 7	27.2	484
5128	Cen A	13 25.5	–43 01.2	S0 pec	7.70	26 × 20	11.9	547
5194	M51	13 29.9	+47 11.7	Sbc I–II pec	9.08	11 × 7	25.8	463
5236	M83	13 37.0	–29 52.0	Sc II	8.31	13 × 12	22.7	513
5457	M101	14 03.2	+54 20.9	Scd I	7.99	29 × 27	22.6	241
6744		19 09.8	–63 51.5	Sbc II	9.38	20 × 13	31.0	841
6822		19 45.0	–14 48.2	IBm IV–V	10.30	16 × 14	1.63	–57
6946		20 34.9	+60 09.2	Scd II	9.64	12 × 10	19.4	40
7793		23 57.8	–32 35.5	Sd IV	9.65	9 × 6	13.6	227

TABLE 2—THE NEAREST GALAXIES—OUR LOCAL GROUP*

Name	RA (2000.0) h	m	Dec °	′	Magnitude B_T	Type	Distance 10^6 ly
Milky Way Galaxy						Sb/c	
IC 10	0	20.3	+59	18	8.18	IBm	2.80
NGC 147	0	33.2	+48	31	10.45	dE5 pec	2.38
And III	0	35.6	+36	30	15.00	dE	2.45
NGC 185	0	39.0	+48	20	10.16	dE3 pec	2.18
M110 = NGC 205	0	40.4	+41	41	9.08	E5 pec	2.61
M32 = NGC 221	0	42.7	+40	52	9.16	E2	2.51
M31 = NGC 224	0	42.7	+41	16	4.16	Sb I–II	2.58
And I	0	45.7	+38	02	13.60	dE3 pec	2.54
SMC	0	52.7	–72	50	2.28	SBm IV–V pec	0.196
Sculptor	1	0.2	–33	43	8.78	dE	0.293
LGS 3	1	3.9	+21	53	14.20	Irr	4.40
IC 1613	1	4.8	+02	07	9.87	IBm V	2.41
And II	1	16.5	+33	25	13.50	dE	2.40
M33 = NGC 598	1	33.8	+30	40	6.29	Scd II–III	2.87
Fornax	2	40.0	–34	27	8.25	dE4	0.456
LMC	5	23.6	–69	45	0.57	SBm III	0.163
Carina	6	41.6	–50	58	11.30	dE3	0.326
Antlia	10	4.1	–27	20	16.19	IBm	4.24
Leo I	10	8.5	+12	18	10.10	dE3	0.782
Sextans	10	13.1	–01	37	10.40	dE	0.293
Leo II	11	13.5	+22	09	12.59	dE0	0.717
Ursa Minor	15	9.1	+67	13	11.90	E	0.228
Draco	17	20.2	+57	55	10.90	E pec	0.261
Sagittarius	18	55.3	–30	33	4.50	IBm:	0.098
NGC 6822	19	45.0	–14	48	10.30	IBm IV–V	1.63

* significantly updated for 2013

Editor's Notes:

(1) Aside from those famous companions of the Milky Way Galaxy, the Large Magellanic Cloud (LMC) and the Small Magellanic Cloud (SMC), there is only one galaxy beyond our own that is easily visible to unaided human eyes: M31, the Andromeda Galaxy (2.58 Mly distant). M33, the Triangulum Galaxy, can also be seen, but this is a difficult observation. To locate M31, see the NOVEMBER ALL-SKY MAP on p. 343, where the tiny cluster of six dots above the first "A" of "ANDROMEDA" indicates its location. With modest optical aid (e.g. binoculars) a dozen or more of the galaxies listed in Table 1 can be seen by experienced observers under dark skies. With a 250-mm telescope, the quasar 3C 273, at one thousand times the distance of M31, can elicit a noticeable signal in the visual cortex (see p. 320).

(2) An interesting article by G. Lake entitled "Cosmology of the Local Group" appears in *Sky & Telescope*, December 1992, p. 613.

(3) The National Aeronautics and Space Administration/Infrared Processing and Analysis Center (NASA/IPAC) Extragalactic Database (NED) is a comprehensive compilation of extragalactic data for nearly 165 million distinct extragalactic objects. The database includes most major catalogues and offers references to and abstracts of articles of extragalactic interest that have appeared in most major journals. Also online are 1.7 billion photometric measurements, 2 million redshifts, over 2 million images, and more than 400 thousand detailed classifications. It is possible to search the main NED database for objects selected by catalogue prefix, position, type, or redshift. The database is available at ned.ipac.caltech.edu. See ned.ipac.caltech.edu/level5 for a knowledgebase of review articles and basic information.

GALAXIES WITH PROPER NAMES

BY BARRY F. MADORE

Below are the catalogue designations and positions of galaxies known to have proper names, which usually honour the discoverer (e.g. McLeish's Object), identify the constellation in which the galaxy is found (e.g. Andromeda Galaxy), or describe the galaxy in some easily remembered way (e.g. Whirlpool Galaxy).

Galaxy Name	Other Names / Remarks	RA (2000) h m	Dec ° ′
Ambartsumian's Knot	NGC 3561, UGC 06224, ARP 105	11 11.2	+28 42
Andromeda Galaxy	M31, NGC 224, UGC 00454	0 42.7	+41 16
Andromeda I		0 45.7	+38 01
Andromeda II		1 16.5	+33 26
Andromeda III		0 35.3	+36 31
Antennae Galaxy	Ring Tail, NGC 4038/39, ARP 244	12 01.9	–18 52
Antlia Dwarf	AM 1001-270	10 04.0	–27 20
Aquarius Dwarf	DDO 210	20 46.9	–12 51
Arp's Galaxy		11 19.6	+51 30
Atoms For Peace	NGC 7252, ARP 226	22 20.8	–24 41
Baade's Galaxies A & B	MCG+07-02-018/19	0 49.9	+42 35
Barbon's Galaxy	Markarian 328, ZWG 497.042	23 37.7	+30 08
Barnard's Galaxy	NGC 6822, IC 4895, DDO 209	19 44.9	–14 48
Bear's Paw (Claw)	NGC 2537, UGC 04274, ARP 6	8 13.2	+46 00
BL Lacertae		22 02.7	+42 17
Black Eye Galaxy	M64, NGC 4826, UGC 08062	12 56.7	+21 41
Bode's Galaxies	M81/82, NGC 3031/4, UGC 05318/22	9 55.7	+69 23
Burbidge Chain	MCG-04-03-010 to 13	0 47.5	–20 26
BW Tauri	UGC 03087, MCG+01-12-009	4 33.2	+05 21
Carafe Galaxy	Cannon's Carafe, near NGC 1595/98	4 28.0	–47 54
Carina Dwarf		6 41.6	–50 58
Cartwheel Galaxy	Zwicky's Cartwheel, MCG-06-02-022a	0 37.4	–33 44
Centaurus A	NGC 5128, ARP 153	13 25.5	–43 01
Circinus Galaxy		14 13.2	–65 20
Coddington's Nebula	IC 2574, UGC 05666, DDO 81	10 28.4	+68 25
Copeland Septet	MCG+04-28-004/05/07 to 11, UGC 06597, UGC 06602, ARP 320, NGC 3745/46/48/50/51/53/54†	11 37.8	+21 59
Cygnus A	MCG+07-41-003	19 59.4	+40 43
Draco Dwarf	UGC 10822, DDO 208	17 20.2	+57 55
Exclamation Mark Galaxy		0 39.3	–43 06
The Eyes	NGC 4435/8, UGC 07574/5, ARP 120a/b	12 27.7	+13 03
Fath 703	NGC 5892	15 13.7	–15 29
Fornax A	NGC 1316, ARP 154	3 22.7	–37 12
Fornax Dwarf	MCG-06-07-001	2 39.9	–34 32
Fourcade-Figueroa	MCG-07-28-004	13 34.8	–45 33
The Garland	S of NGC 3077 = UGC 05398	10 04.2	+68 40
Grus Quartet	NGC 7552/82/90/99	23 17.8	–42 26
GR 8 (Gibson Reaves)	UGC 08091, DDO 155	12 58.7	+14 13
Hardcastle's Galaxy	MCG-05-31-039	13 13.0	–32 41
Helix Galaxy	NGC 2685, UGC 04666, ARP 336	8 55.6	+58 44
Hercules A	MCG+01-43-006	16 51.2	+04 59
Hoag's Object		15 17.2	+21 35

† Position errors caused these to be historically marked as nonexistent in the NGC and RNGC.

GALAXIES WITH PROPER NAMES (continued)

Galaxy Name	Other Names / Remarks	RA (2000) h m	Dec ° ′
Holmberg I	UGC 05139, DDO 63	9 40.5	+71 11
Holmberg II	UGC 04305, DDO 50, ARP 268	8 19.3	+70 43
Holmberg III	UGC 04841	9 14.6	+74 14
Holmberg IV	UGC 08837, DDO 185	13 54.7	+53 54
Holmberg V	UGC 08658	13 40.6	+54 20
Holmberg VI	NGC 1325a	3 24.9	–21 20
Holmberg VII	UGC 07739, DDO 137	12 34.7	+06 17
Holmberg VIII	UGC 08303, DDO 166	13 13.3	+36 12
Holmberg IX	UGC 05336, DDO 66	9 57.6	+69 03
Horologium Dwarf	Schuster's Spiral	3 59.2	–45 52
Hydra A	MCG-02-24-007	9 18.1	–12 06
Integral Sign Galaxy	UGC 03697, MCG+12-07-028	7 11.4	+71 50
Keenan's System	NGC 5216/16a/18, UGC 08528/9, ARP 104	13 32.2	+62 43
Kowal's Object		19 29.9	–17 41
Large Magellanic Cloud	Nubecula Major	5 23.6	–69 45
Leo I	Regulus Dwarf, UGC 05470, DDO 74, Harrington-Wilson #1	10 08.5	+12 18
Leo II	Leo B, UGC 06253, DDO 93, Harrington-Wilson #2	11 13.4	+22 10
Leo III	Leo A, UGC 05364, DDO 69	9 59.3	+30 45
Lindsay-Shapley Ring	Graham A	6 42.8	–74 15
Lost Galaxy	NGC 4535, UGC 07727	12 34.3	+08 11
McLeish's Object		20 09.7	–66 13
Maffei I	UGCA 34	2 36.3	+59 39
Maffei II	UGCA 39	2 42.0	+59 37
Malin 1		12 37.0	+14 20
Mayall's Object	MCG+07-23-019, ARP 148	11 03.9	+40 50
Mice	NGC 4676a/b, UGC 07938/9, IC 819/20, ARP 242	12 46.1	+30 44
Miniature Spiral	NGC 3928, UGC 06834	11 51.8	+48 41
Minkowski's Object	ARP 133 (NE of NGC 541)	1 25.8	–01 21
Pancake	NGC 2685, UGC 04666, ARP 336	8 55.6	+58 44
Papillon	IC 708, UGC 06549	11 33.9	+49 03
Pegasus Dwarf	UGC 12613, DDO 216	23 28.5	+14 44
Perseus A	NGC 1275/6, UGC 02669	3 19.8	+41 31
Phoenix Dwarf Irregular		1 51.1	–44 26
Pinwheel Galaxy	see also Triangulum Galaxy	1 33.9	+30 39
Pinwheel Galaxy	M99, NGC 4254, UGC 07345	12 18.8	+14 25
Pinwheel Galaxy	M101, NGC 5457, UGC 08981, ARP 26	14 03.3	+54 22
Pisces Cloud	NGC 379/80/82-85, UGC 00682/3/6-9, ARP 331	1 07.5	+32 25
Pisces Dwarf	LGS 3	0 03.8	+21 54
Polarissima Australis	NGC 2573	1 42.0‡	–89 20
Polarissima Borealis	NGC 3172, ZWG 370.002	11 50.3‡	+89 07
Reinmuth 80	NGC 4517a, UGC 07685	12 32.5	+00 23
Reticulum Dwarf	Sersic 040.03	4 36.2	–58 50
Sagittarius Dwarf		19 30.0	–17 41
Sculptor Dwarf	MCG-06-03-015	1 00.2	–33 42
Sculptor Dwarf Irregular		0 08.1	–34 34

‡The high declination of these objects makes the RA particularly uncertain.

GALAXIES WITH PROPER NAMES (continued)

Galaxy Name	Other Names / Remarks	RA (2000) h m	Dec ° ′
Seashell Galaxy	Companion to NGC 5291	13 47.4	–30 23
Sextans A	UGCA 205, MCG-01-26-030, DDO 75	10 11.0	–04 41
Sextans B	UGC 05373, DDO 70	10 00.0	+05 19
Sextans C	UGC 05439	10 05.6	+00 04
Sextans Dwarf		10 13.1	–01 37
Seyfert's Sextet	Serpens Sextet, NGC 6027/6027a-e, UGC 10116	15 59.2	+20 46
Shapley-Ames 1		1 05.1	–06 13
Shapley-Ames 2	NGC 4507	12 35.1	–39 55
Shapley-Ames 3	MCG-02-33-015	12 49.4	–10 07
Shapley-Ames 4	UGC 08041	12 55.2	+00 07
Shapley-Ames 5	MCG-07-42-001	20 24.0	–44 00
Shapley-Ames 6		21 23.2	+45 46
Siamese Twins	NGC 4567/4568	12 36.5	+11 15
Silver Coin	Sculptor Galaxy, NGC 253, UGCA 13	0 47.6	–25 18
Small Magellanic Cloud	Nubecula Minor	0 52.7	–72 50
Sombrero Galaxy	M104, NGC 4594	12 39.9	–11 37
Spider	UGC 05829, DDO 84	10 42.6	+34 27
Spindle Galaxy	NGC 3115	10 05.2	–07 42
Stephan's Quintet	NGC 7317-20, UGC 12099-102, ARP 319	22 36.0	+33 58
Sunflower Galaxy	M63, NGC 5055, UGC 08334	13 15.8	+42 02
Triangulum Galaxy	Pinwheel, M33, NGC 598, UGC 01117	1 33.9	+30 39
Ursa Minor Dwarf	UGC 09749, DDO 199	15 08.8	+67 12
Virgo A	M87, NGC 4486, UGC 07654, ARP 152	12 30.8	+12 23
Whirlpool Galaxy	Rosse's Galaxy, Question Mark Galaxy, M51, NGC 5194/5, UGC 08493/4, ARP 85	13 29.9	+47 12
Wild's Triplet	MCG-01-30-032 to 34, ARP 248	11 46.8	–03 49
Wolf-Lundmark-Melotte	MCG-03-01-015, DDO 221	0 02.0	–15 28
Zwicky #2	UGC 06955, DDO 105	11 58.4	+38 03
Zwicky's Triplet	UGC 10586, ARP 103	16 49.5	+45 30

Catalogues:

AM *Catalogue of Southern Peculiar Galaxies and Associations*, by H.C. Arp and B.F. Madore, Cambridge University Press (1987).

ARP *Atlas of Peculiar Galaxies*, H. Arp, *Ap. J. Suppl. 14*, 1 (1966).

DDO *David Dunlap Observatory Publ.*, S. van den Bergh, II, No. 5, 147 (1959).

IC *Index Catalogue*, J.L.E. Dreyer, *Mem. R.A.S.* (1895–1910).

MCG *Morphological Catalogue of Galaxies*, B.A. Vorontsov-Velyaminov et al., Moscow State University, Moscow (1961–1974).

NGC *New General Catalogue of Nebulae and Clusters of Stars*, J.L.E. Dreyer, *Mem. R.A.S.* (1888).

RNGC *The Revised New General Catalogue of Nonstellar Astronomical Objects*, J.W. Sulentic and W.G. Tifft, University of Arizona Press (1973).

UGC *Uppsala General Catalogue of Galaxies*, P. Nilson, *Nova Acta Regiae Societatis Scientiarum Upsaliensis*, Ser. V: A, Vol. 1, Uppsala, Sweden (1973).

UGCA *Catalogue of Selected Non-UGC Galaxies*, P. Nilson, Uppsala Astronomical Observatory (1974).

ZWG *Catalogue of Galaxies and Clusters of Galaxies*, F. Zwicky et al., Vol. 1–6, California Institute of Technology (1961–1968).