Session XII

An H I Rogues Gallery

Gas & Galaxy Evolution
ASP Conference Series, Vol. 240, 2001
J.E. Hibbard, M.P. Rupen, and J.H. van Gorkom, eds.

An H I Rogues Gallery

J.E. Hibbard

NRAO

J.H. van Gorkom

Columbia University

Michael P. Rupen

NRAO

David Schiminovich

Caltech

Abstract. We have begun a compilation of H I maps of peculiar galaxies kindly contributed by individual investigators, many as part of the "Gas & Galaxy Evolution" conference. In this gallery we present images of the first ~180 objects, which includes over 400 individually cataloged galaxies. The images consist of a greyscale representation of the optical morphology and an accompanying optical image with H I contours superimposed. A web-based "living Gallery" is being maintained on the NRAO homepage (presently at *http://www.nrao.edu/astrores/HIrogues/*).

1. Introduction

Arp's "Atlas of Peculiar Galaxies" (Arp 1966) appeared forty years after the discovery that galaxies are independent stellar systems. It was motivated by some of the questions which form central themes of this conference: How are elliptical galaxies related to spirals? How are galaxies formed, and how do they evolve? These questions are just as compelling today as they were in 1966. It is certainly true that optical compilations of the bizarre objects collected by Arp and others (notably, Vorontsov-Vel'yaminov 1959, 1977; Arp & Madore 1987; Malin & Carter 1983) and the detailed studies that they motivated have brought us an appreciation that peculiar galaxies have an importance far in excess of their statistical occurrence in galaxy catalogs, where they comprise anywhere from 3–9% of all objects (Arp & Madore 1975; Struck 1999). Still, thirty-five years later these questions remain largely unanswered.

By the time atlases of peculiar galaxies appeared, there were several catalogs devoted to demonstrating the various forms of galaxy morphology. Most prominent among these is the Hubble Atlas. These catalogs are arranged in sequences based on the symmetry of the optical morphologies, and focus on single galaxies in isolation, with asymmetric forms relegated to catch-all categories and illustrated with but a few token examples. The compendiums of peculiar galaxies, on the other hand, highlight those forms which deviate from symmetry, with the thinking that such objects are transitional forms illustrating the most spectacular phases of galactic evolution, and perhaps formation.

Optical morphology alone provides an interesting yet incomplete view of galaxies. This is particularly true when considering peculiar systems. The s-tarlight in galaxies rarely extends beyond a few optical scale-lengths, well within the dark matter halos that are widely believed to surround galaxies. Any tracer that extends to larger radii will probe the influence of a larger fraction of the mass of galaxies and, because the dynamical time scales with radius, will sample galactic influences further in the past. The 21 cm line of neutral hydrogen forms just such a tracer. Since the early days of radio astronomy, it has been known that the neutral gas often extends much further than the optical light (Roberts & Rots 1973). Additionally, hydrogen is the raw material from which stars and therefore galaxies are ultimately formed, so if large reservoirs of it exist at the present time, we might hope to find signatures of on-going formation processes in the neutral gas. No picture of galaxy formation and evolution is complete without knowledge of how the gas is distributed at large radii.

It is somewhat surprising, then, that thirty-five years after the optical compilation of Arp, no such compilation of H I maps exist for peculiar galaxies. This is not for lack of such observations. H I mapping requires an extensive investment in telescope time and post-observation reduction, limiting most studies to a few to a dozen objects in any give observational program. Nonetheless, an impressive amount of data on H I in weird galaxies and weird H I in otherwise normal galaxies has been amassed over the years. By our count, more than 400 peculiar systems have been mapped in H I. This may be far below the number of objects typically assembled in optical catalogs, but it is enough to warrant an attempt to assemble and arrange them in some organized form.

This Gallery is intended to do just that, and we have taken the occasion of this meeting, celebrating the twentieth anniversary of the VLA, to make a first attempt at its compilation. We concentrate on H I maps of peculiar galaxies or peculiar H I in otherwise normal galaxies, rather than attempting to include all Hubble Types. We have further limited ourselves to very disturbed systems, by and large including only a few (or no) examples of systems with less extreme peculiarities. There are already relatively large compilations of the H I morphology of "normal" Hubble types, many of which exhibit both minor and major peculiarities, in (motsly Dutch) theses or journal supplements (e.g. Wevers, van der Kruit & Allen 1986; Bosma 1978; Warmels 1988; Cayatte et al. 1990; van Driel & van Woerden 1991; Oosterloo 1988; Broeils 1992; Swaters 1999; Verheijen & Sancisi 2001), and the growing database of the Westerbork H I Survey of Irregular and Spiral Galaxies (WHISP) will eventually contain more than 400 late-type galaxies (van der Hulst, van Albada & Sancisi, these proceedings, p. 451). On the other hand, no large compilation of H I in peculiars exits anywhere. This "Rogues Gallery" is our attempt to remedy this situation.

This is a very subjective compilation, assembled because one of us noticed the H I map of a given object somewhere and considered it interesting, or had marked the galaxy as an optically interesting object and subsequently searched the literature or telescope archives for existing HI observations. This assemblage is definitely not complete, and may not even be representative of all the forms of peculiar HI morphologies — for that we would need an optically blind HI survey. But one has to start somewhere, and this is where we have decided to start.

Following the practice of Hubble, Sandage, Arp, and Madore, we have divided the Gallery into several morphological classes. These are described in detail in §3. Within each class we have attempted to arrange objects in a suggestive morphological sequence, where the principles behind those sequences are described in §3.1. The general theme is the connection of similar forms, related from a dyamical (as with the class of interacting galaxies) or a morphological viewpoint (as with the class of galaxies with warps and/or asymmetries). Sometimes there is no clear transition between objects, and the category is just a compilation of systems that fall within the broadly defined class (as with the class of galaxies with extended HI envelopes).

The Gallery is laid out as follows. We describe the subjective gathering of the images and the proper way to reference them in §2. In §3 we define the different classes used and explain how objects are ordered in the Gallery. The layout of the images is described in §4, while §5 describes the tables and their entries. The acknowledgements appear in §6, followed by the tables, and finally the Gallery itself. At the end of the Gallery we have collected abstracts for authors who have allowed us to reproduce images prior to their publication in the literature.

2. Sources of Images and References

A list of candidate objects for the Gallery has been continuously assembled from the literature and personal communications by JEH. Prior to this meeting, we also searched the VLA archive and the compilation of Martin (1998) for HI mapping observations of galaxies noted by us to be optically peculiar in some manner. As such, this is an entirely subjective assemblage and can in no way be considered complete. We do hope that it is representative (although it may well not be).

Using this list as a guide, we tried to contact the observers who made the observations in the early part of 2000 to see if they would consider donating FITS images or postscript files of the resulting HI maps for inclusion in the Gallery. We made another attempt to increase the number of objects in the early part of 2001. The present collection includes the results (please see §6 for acknowledgments). It amounts to 181 systems (including over 400 individually cataloged galaxies) out of our original list of $\sim$ 400; there is thus much room for improvement. Additionally, there are likely a large number of objects, either published or unpublished, that we have missed entirely. We plan on actively maintaining this Gallery on the NRAO webpage (currently stored at *http://www.nrao.edu/astrores/HIrogues/*), and encourage observers who notice any omissions (or wish themselves to contribute an image) to contact us.

The HI maps in this compilation are mainly from two major centimeter wavelength interferometers, the Very Large Array (VLA) and the Westerbork Synthesis Radio Telescope (WSRT). A few images were taken from observations with the Australia Telescope Compact Array (ATCA), but there are undounbtedly dozens of systems observed with that telescope which are not included here. Our hope is that we can remedy this in the near future, or perhaps that there will be a Northern and Southern Gallery maintained at NRAO and ATNF (a list of all galaxies observed with the ATCA is presently maintained at *http://wwwatnf.atnf.csiro.au/people/bkoribal/atca_obs.html*). Similarly, although no mapping observations from the Giant Metrewave Radio Telescope (GMRT) are included so far, that instrument is likely to become another major source of images in the future. It is notable that we have included only four mapping observations made with single dish telescopes, primarily because such maps are often unavailable in machine readable form. We can expect very interesting results on the large scale gaseous distribution of local galaxies from single dish maps from the HIPASS survey with Parkes telescope (see Koribalski, these proceedings, p. 439) and the Green Bank Telescope in the near future.

Many of the images presented in this Gallery have appeared in the literature. However, we are particularly and deeply grateful for those observers who have made their data available prior to publication. To ensure that these observers receive proper credit for this work, we have collected short abstracts under their names at the end of the Gallery, which include brief descriptions of these observations. If readers wish to reference these images, they should cite the abstracts, which are also referenced in the figure captions.

3. Rogues Gallery Classifications

In this first attempt at constructing an atlas of this sort, we have arranged the systems following the lead of Arp (1966). In particular, we define several broad morphological classes, but make no clear breaks between the classes, and the objects are often arranged so that the last objects of one class are similar to the first objects of the following one. Overall, the major motivation for placing an object on a specific page is to have it appear between systems that it most resembles.

These classes are defined morphologically, and within each category, objects are presented in a suggestive sequence. The order within a class is sometimes motivated by dynamical considerations, e.g., the arrangement of interacting galaxies in a suggested evolutionary sequence. These motivations and guiding principles are explained in the following sub-section, which also gives detailed motivations for placing some specific objects in one sequence rather than another.

Table 1 shows the arrangement of the Gallery, along with the criteria for ordering of objects within classes, and Table 2 lists the individual galaxies in the order in which they appear. As mentioned above the last object of one class is often similar to the first object of the next one. The classification of galaxies is a very subjective task, and many systems could easily fit into several categories. This is a work in progress and we welcome your comments.

3.1. Detailed Notes on Classifications and Ordering

The first class of objects in the Gallery is **Galaxies with Extended H I Envelopes**, where the H I extent is compared to the underlying optical light rather than to a fixed physical scale. The rest of the Gallery is dominated by interacting systems, many of which also have very extended H I distributions. In this first class, we include objects which do not *apparently* owe their extended H I to an interaction*. By this we mean that there is not an obvious partner with which the system is interacting, nor are there tell-tale signs of a prior minor or major merger event (see below), such as stellar shells and loops or multiple nuclei.

This classification includes many Blue Compact Dwarfs (BCDs), although BCDs also appear elsewhere in the Gallery. For example, UGC 00521 appears with warps, and there are several BCDs filed under *Miscellaneous*, which may not have been mapped with enough sensitivity to determine whether or not they have extended gas envelopes. BCDs are some of the most unevolved systems in the nearby universe, in terms of their stellar content and metallicity, and as such this *Extended H I* class may include examples of galaxies actually forming out of the gaseous reservoirs in which they are embedded. For this reason, we have arranged galaxies within this class based on the regularity of their H I morphology: galaxies with very irregular outer H I are at the beginning, and galaxies with disk-like H I distributions are at the end.

The next class is **Galaxies with H I Extensions**. The first subclass is **Galaxies with Two-Sided Warps**. This is the perhaps the most under-represented class included in the Gallery, as warps are rather common (Bosma 1991). Here we have simply collected some representative examples. This includes the very peculiar system NGC 3718 (Fig. 13). We have placed it here because, like the two-sided warps, it has a 180° sense of symmetry, and we could not think of a more suitable place for it.

The two-sided warps are followed by **Galaxies with One-Sided H I Extensions**. Within this subclass are galaxies whose H I morphology is believed to be due to Ram Pressure Stripping (Figs. 21 — 26). The next system, the BCD galaxy NGC 4861 (Fig. 27), has both an extended H I envelope and an H I cloud with no optical counterpart, making it the perfect connector to the next subclass, **Galaxies with Detached H I Clouds**†. This is another group of galaxies which is poorly represented in the Gallery, and many more examples appear in the literature. The qualifier "no optical counterpart" obviously depends on the quality of the existing optical data, and to hedge our bets, we have placed this classification between "H I extensions" and the next class of systems, the *Minor Mergers*. This way, if an optical counterpart to the H I cloud is subsequently identified, the Gallery needs not be re-ordered. Similarly, the first member of the Minor Mergers, M 108 (Fig. 30), has an H I extension toward an optical companion, but the optical companion does not have a known redshift. If it is subsequently shown to be a background object, then this system naturally falls into the prior subclass.

As just mentioned, the next class of systems is the **Minor Mergers**. These are two (or more) galaxies which are physically close to each other and show signs of interacting, and in which one of the galaxies is much larger or much

*This is a somewhat circular argument, since the prime evidence for an interaction is often the extent of the gas distribution, and there are papers in the literature for nearly all of the objects in this class claiming an interacting or merging origin based on this fact.

†We note that many of the galaxies in other parts of the Gallery have H I clouds with no identified optical counterparts, but are classified according to their most dominant H I characteristics.

brighter than the other(s). While we have by no means quantified the relative size or luminosity ratio, we estimate that the companion is of order 1/4 or less the size or luminosity of the primary. These systems are arranged in order of decreasing separation between the component galaxies. With the exception of M 108, all the pairs of Minor Mergers have known redshifts which imply a physical associaton.

Within the class of Minor Mergers, we include several subclasses. The first is **M 51 Types**: large grand-design spirals with small companions at the end of one of the spiral arms. The next subclass is **3-body Encounters**, of which M 81 (Fig. 53) is the prototype. These are different from the class of Triples later in the Gallery, as one of the participants appears much larger or brighter than the others. The Mrk 348 system (Fig. 52) is a member of both of these subclasses: it has a small companion at the end of a spiral arm, and an H I distribution very similar to M 51 (although on a much larger physical scale); but there is also a large neighbor (NGC 266) to the northwest, which may have played some role in shaping the outer H I morphology.

After the 3-body encounters comes NGC 1097 (Fig. 57), which is placed here because its companion (NGC 1097A) appears about ready to merge with it. This is followed by the **Minor Merger Remnants**. These have a single identifiable nucleus, but optical morphological peculiarities typically ascribed to strong gravitational disturbances, such as shells, ripples, tails, and plumes. They appear here, as opposed to the later class of *Merger Remnants*, because of the continued survival (or re-formation?) of a large disk. It is widely believed that major mergers destroy disks. While we are not convinced of this fact, the literature on these objects discusses them almost exclusively in terms of a minor merger origin, so we adopt those results here.

The next class of galaxies is the dominant class represented in the Gallery: **Interacting Doubles or Major Mergers**. These are galaxies of apparently similar mass which are physically associated. This classification has taken precedence over other classifications except *Triples — Groups*. For example, if the outer H I morphology appears clearly tidal in origin, we have placed the system in this class rather than under the category of *H I Extensions*.

We have subdivided this category into five separate subclasses. In doing so we draw heavily on the lessons learned in the pioneering study of interacting galaxies by Toomre & Toomre (1972; see also Barnes 1998). Specifically, from that work we learn the following: (1) tidal features first form shortly after first orbital periapses; (2) tails are formed at the rate of one per prograde disk; (3) high-inclination or retrograde encounters lead to large epicyclic motions within the disk, but do not form well-defined tails; and (4) bridges form from a wide range of encounter geometries. Further, we know that later-type spirals tend to be rich in H I, whereas lenticulars and ellipticals tend to be gas poor (Roberts & Haynes 1994).

With these considerations in mind, we have morphologically defined several subclasses which we think are dynamically related to the Hubble types of the participants and the spin geometry of the encounter. We emphasize that this classification is *purely morphological*: we have made no attempt to check the proposed spin geometries against the velocity fields of the galaxies. The subclasses are defined as follows:

Two H I Systems; Two Tails: from the above dynamical considerations, we suspect that these are interactions between two prograde disk galaxies, which we indicate in Table 1 by the notation $(Sp^+ - Sp^+)$, where Sp denotes a spiral progenitor, and the + superscript denotes the suggested prograde spin geometry. Objects within this subclass are arranged by decreasing nuclear separation, with well-separated objects at the beginning and single objects with two tails at the end. II Zw 40 (Fig. 6) may reasonably be placed midway through this sequence, but we left it with the BCDs in the class of *Galaxies with Extended H I Envelopes.*

Two H I Systems, One H I Tail: from the above dynamical considerations, we suspect that these involve interactions between two spiral disk galaxies, only one of which has a prograde geometry. The second disk might have a highly inclined or a retrograde spin geometry, indicated by a superscript 0 in the $(Sp^+ - Sp^0)$ notation in Table 1. Objects within this subclass are again arranged by decreasing nuclear separation, with well-separated objects at the beginning and single objects with a single tail at the end. Arp 295 (Fig. 159) belongs near the beginning of this sequence, but has been placed with *Groups...* due to its large number of H I companions. The first member of this subclass, the LMC/SMC/MS system (Fig. 73), may more properly belong to the class of 3-body encounters under *Minor Mergers*, but we decided to place it according to the morphology exhibited in the figure. Arp 215 (Fig. 60) might reasonably be placed at the end of this sequence, rather than with the *Minor Merger Remnants.*

Two H I Systems, Bridge, No Tails: we suspect that these involve interactions between two highly inclined or retrograde disk galaxies, denoted by the $(Sp^0 - Sp^0)$ notation in Table 1. The first members of this subclass may well have different spin geometries and be caught prior to first orbital periapse, but they fit the above morphological definition so are placed here. The galaxies in this subclass are arranged with nuclear separation first decreasing as morphological distortion increases, then with nuclear separation increasing as more bridge material appears between the two systems. Notably, there are no Merger Remnants included at the end of this sequence. Since the tidal signatures of such encounters are not as well defined, it is much harder to make a confident classification of such objects after the progenitors have merged. VV 114 (Fig. 107 under *Merger Remnants*) may be an example of such an object. The reader will notice that this sequence ends with Ring Galaxies, which also starts the next subclass.

Two Systems, Only One with H I: These are presumably encounters between one gas-rich and one gas-poor progenitor ($E - Sp$ notation). The first few systems in the subclass exhibit no tails, while the remaining systems all show one tail. The first three continue the theme of the last five systems of the previous subclass by showing Ring Galaxies, but in this case the smaller penetrating galaxy has no gas. It is possible that the gas was stripped as this system passed through the gas-rich target system, or that the progenitor was always gas-poor. In the Arp 104 system (Fig. 101) it looks like the southern system has a gas-rich tail, but the morphology of this feature resembles numerical simulations in which bridge material passes through the companion and emerges on the opposite side.

The final subclass of Interacting Doubles is that of **Merger Remnants of Indeterminate Origin**. These systems are clearly the result of the coalescence of separate stellar systems, but it is really not possible to say what has merged or how.

All of the previous classes have been dominated by late-type or spiral galaxies. The next major class, **Peculiar Early Types or Early Types with Peculiar HI**, is centered around early types and ellipitcals. Many of these may be Merger Remnants, others may be Minor Merger Remnants, and yet others may owe their gas and/or optical morphological peculiarities to their dense local environments. Since these origins are very difficult to distinguish, we have made subclasses based on both their optical and HI morphology.

The first subclass is **Peculiar Ellipticals with HI Outside the Optical Body**, and is ordered by the amount of HI in the outer regions (from lots of HI to no HI). This sequence may be considered a possible extension of the Toomre Sequence of Major Mergers (Toomre 1977), demonstrating how gas-rich disk galaxies might fall together, merge, and leave a gas-poor bulge-dominated galaxy in their place. The amount of optical peculiarity decreases along this sequence (but not uniformly), with more subtle optical peculiarities in the later than in the earlier stages. At the end of this sequence we have included a montage of optically peculiar early types mapped in HI, but in which the HI is not associated with the early type galaxy. These provide an interesting counterpart to optically peculiar systems in which HI has been detected. It is possible that more sensitive HI observations might uncover some HI in these systems, but clearly it will be less than in those that have already been detected. These systems are ordered by decreasing optical peculiarity, as quantified by the Fine Structure Index (FSI) of Schweizer & Seitzer (1992). This index quantifies the number of shells, jets, plumes, ripples, and "X"-structures, as well as the boxiness of the galaxy. We note that many of these galaxies exhibit quite striking peculiarities when imaged with modern CCDs, and the reproductions here, taken from the Digital Sky Survey, really do not do them full justice.

The next subclass is **Peculiar Early Types with HI Within the Optical Body**. These are arranged by the degree of regularity of the HI. The early systems have a very irregular HI distribution, and the distribution becomes more symmetric and disk-like as the sequence progresses. This sequence demonstrates the intriguing possibility that in some cases enough cold gas is accreted onto a bulge-dominated galaxy to form (or re-form) a disk.

This is followed by **Normal Early Types with Peculiar HI**. These galaxies have no obvious optical peculiarities (certainly at a much lower level than the preceding two classes), but have some very interesting HI distributions. This emphasizes the point that it is very difficult, if not impossible, to guess the HI morphology based on a system's optical appearance. The first system of this subclass, the polar ring galaxy UGC 7576 (Fig. 130), could equally well have been the last system of the previous subclass. After this, the HI distribution becomes increasingly irregular along the sequence. Unlike the previous two subclasses, this ordering is not meant to suggest an evolutionary sequence. Rather, this ordering forms a natural transition from the disk-like HI distributions of the previous subclass, to the irregular distribution of the next class of objects.

Given the normal optical appearance of the hosts, we are not sure what to make of this subclass of objects. It is possible that future optical observations will reveal as-yet-undiscovered optical peculiarities in these systems, and that they may fit naturally into one of the previous two categories. It is also feasible that the H I has a tidal origin, and for some reason the encounter geometry left the outer tidal gas in an irregular distribution long after the inner regions have relaxed. In this case, these systems would be an extension of the previous two categories. Yet another possibility is suggested by the fact that most, if not all, of the members of this subclass live in group environments; in this case the gas may have been stripped from the outer regions of other members and accreted onto the early type, which is usually one of the largest members of the group. These objects may therefore belong to the class of *Interacting Triples — Groups — Clusters*. In the latter class however the effects of interaction are manifested optically, so we have elected to keep these classes separate. The most interesting possibility (in our opinion) is that the gas in these systems was never in a galaxy, and represents accretion from a primordial reservoir. At present it is not possible to discriminate between these and other possible scenarios, but this is in any case one of the most intriguing categories of objects in the Gallery.

The next class of objects is just as interesting, comprising galaxy systems with **Intergalactic Debris with No Optical Counterpart**. These three objects could easily have been categorized into other classes (the Leo Ring with the previous class; NGC 5291 with peculiar early types with H I within the optical body; and NGC 4532 with galaxies with one-sided extensions, or with the minor mergers). We have placed them into a separate category since in these cases the relation between the H I and the neighboring galaxies is less clear.

Interacting Triples — Groups — Clusters form the next major class. As mentioned above, there are a lot of similarities between the H I distribution seen in triples and groups and those shown in the previous three subclasses of objects, but here there are clear optical distortions suggesting more directly an interaction origin for the intergalactic gas. This class is ordered (for the most part) by the increasing number of members. The exception is at the end, where we have put three early-type-dominated groups. In each of these last three systems there is a significant extended X-ray component, which must have some effect on the presence or absence of cold gas.

Finally, there is the unavoidable **Miscellaneous** class. These objects do not obviously belong to any of the preceding classes, nor are there enough similar characteristics to warrant the creation of additional classes. The first examples of this class (the low-redshift QSOs and the E+A galaxy) have been called interacting galaxies, but this conclusion was based on the H I distribution. If there is anything we have learned from the compilation of the Gallery, it is that weird H I distributions need not always arise due to interactions.

4. Description of Gallery Figures

We have attempted to present the data in as uniform a manner as possible. To facilitate this, many users contributed the original data in FITS format. The basic H I data are the integrated H I intensity maps (zeroth moment), which give the integrated flux ($\int S\Delta v$; units of mJy beam^{-1} km s^{-1}) at each location. This is usually constructed with the windowing technique to suppress the inclusion of noise (Bosma 1978). The contour levels are given in terms of the surface density, N_{HI} (in units of H atoms per cm^2), which is obtained from the integrated flux via the equation (see Spitzer 1978, eqn. 3.38):

$$N_{HI} = \frac{1.104 \times 10^{21} \mathrm{cm}^{-2}}{\theta_x \times \theta_y} \frac{\int S \Delta v}{\mathrm{mJy\,beam^{-1}\,km\,s^{-1}}} \tag{1}$$

where $\theta_x \times \theta_y$ is the full-width at half-maximum (FWHM) size of the synthesized beam along the major and minor axis, measured in arcseconds, and the gas is assumed to be optically thin.

The N_{HI} contour levels are given in each figure caption, and are usually separated by factors of two. For a small number of systems, it was not possible to derive contour levels.

Spectral line observations also provide line-of-sight velocity information. This information is very informative, but we have decided against its inclusion here, mostly because we had our hands full collecting the integrated intensity maps, but also because such maps beg for a color reproduction. In the future we hope to make the velocity and velocity dispersion maps available, but for the present the readers should refer to the cited literature.

The H I data is shown alongside and contoured upon optical images of each object. When available, we use existing optical CCD data, predominantly donated by the H I observers. Where optical data were not available, we use the Digitized Sky Survey (DSS) image obtained from the Space Telescope Science Institute. We use the second generation survey products when available, prefering the blue plates to the red.

There is a wealth of information available in the data, and a single format does not do it justice. We have therefore used a combination of layouts. In order to reproduce the figures at as large a scale as possible, the figure captions do not describe the figure layout, which we believe to be reasonably self-evident. The various layouts are described here. The simplest involves a greyscale representation of the optical image on the left, and the optical image with H I column density contours on the right. When the faint optical structure warrants it, we present two representations of the optical data with different transfer functions, in addition to the optical image with H I contours superimposed. Finally, when the complexity of the H I structure warrants it, we also present a greyscale representation of the integrated H I emission. These images show clearly H I minima and maxima, which may be ambiguous in the contour maps. When we do show a greyscale map of the H I, we sometimes include contours. These are most often single contours from the optical data. When there are multiple contours, these are spaced by factors of ten apart. On a few occasions we show H I contours upon the H I greyscales. Since the H I and optical morphologies are so different, it should be obvious what the contours represent.

Positive H I contours are drawn with dark solid lines, and negative contours (e.g., H I absorption against radio continuum sources) are drawn with dashed and/or light lines. Occasionally a larger or smaller field of view (FOV) is also shown, to illustrate either the large-scale H I distribution, or more distant H I-detected companions, or to show details of the inner regions. The smaller FOV is usually indicated by dotted boxes in the larger FOV image.

As mentioned above, the information in the figure captions is kept to a minimum. For the HI data we report the telescope (and array configuration for VLA data), synthesized beam resolution (FWHM), and contour level. For the optical data we report the telescope and filter combination, or simply "DSS" when data from the Digital Sky Survey are used, and we give for each image the approximate FOV in arcminutes. There is a section for minimal notes, and finally the reference. Unpublished data is listed as "[authors], these proceedings" with a page number. These refer either to contributions presented at the conference and collected in the first part of these proceedings, or to abstracts collected at the end of the Gallery.

In the first panel of each figure we label each galaxy with a catalog designation and the Hubble Type reported in the NASA Extragalactic Database (NED). We also indicate whether NED lists the galaxy with a Seyfert classification. These classifications have not been verified, and should only be used as rough guides. They are included because we find it interesting when galaxies classified as early types are found to have lots of HI, and when galaxies classified as spirals are found to have none or very little. Using NED we have attempted to identify all cataloged galaxies with HI detections, as well as galaxies with known redshifts which place them within the range of the HI observations. Galaxies with their names labeled in parenthesis have redshifts which put them in the foreground or background.

5. Tables

At the beginning of the Gallery we present three tables.

Table 1 outlines the arrangement of the Gallery by morphological class and subclass as described in §3. It gives one line descriptions of the classes and the abbreviations used to indicate the class in Table 3.

Table 2 is the Table of Contents for the Rogues Gallery. It lists the galaxies in the order in which they appear in the Atlas, grouped by class, followed by the Figure and page number.

Table 3 presents basic information for all 432 of the cataloged galaxies labeled in the 181 images of the Rogues Gallery. The entries are listed in order of increasing Right Ascension (J2000) of the main target galaxy in the image. The galaxies are grouped by image and groups are separated by thick horizontal lines. Within a group individual galaxies are separated by thin horizontal lines. In the first two columns we list the most popular catalog names. In column three we list the J2000 coordinates and the heliocentric radial velocity (km sec^{-1}). All information in these first three columns is taken directly from a batch query to the NASA Extragalactic Database (NED) in July of 2001. Column 4 lists the morphological type as found in NED, the RSA (Sandage & Tamman 1987) and the RC3 catalogs (de Vaucouleurs et al. 1991). Column 5 gives the class as defined in §3 and Table 1, and the Figure and page number.

In addition to the three table mentioned above, there is a comprehensive object index at the end of this volume, which includes all objects in the Rogues Gallery.

6. Acknowledgments

We could not have compiled this collection without the generosity of dozens of H I observers within the community. Many of these contributions came as part of the general conference, although others who were unable to attend also contributed. We would like to offer our sincere thanks to these people for making this gallery possible, and implore the reader to properly reference the original work. Specifically, this atlas has greatly benefited from the specific contributions by Tyler Nordgren, Marc Verheijen, Jim Higdon, Rob Swaters, Caroline Simpson and collaborators, Jeremy Lim, D.J. Pisano, Marcel Clemens, Carole Mundell, Salman Hameed, Eric Wilcots, Liese van Zee, Pierre-Alain Duc, Dave Hogg, Judith Irwin, Michele Kaufman, Bev Smith, Veera Boonyasait, Elias Brinks, Vassilis Charmandaris, Jayanne English, Deidre Hunter, Linda Sparke, Andrea Cox, Lourdes Verdes-Montenegro, Min Yun, Phil Appleton, Jim Condon, Michiel Kregel, Glen Langston, Tom Oosterloo, Oak-Kyoung Park, Mary Putman, Rich Rand, Arnold Rots, Sue Simkin, Lister Staveley-Smith, Athanasios Taramopoulos, Helen Thomas, Wei-Hao Wang, and Barbara Williams. We also thank Garrett Bauer and Karen Yeh for adding the FOVs to the image captions.

The VLA is a facility of the National Radio Astronomy Observatory, which is operated by Associated Universities Inc. under cooperative agreement with the National Science Foundation.

The Digitized Sky Surveys were produced at the Space Telescope Science Institute under U.S. Government grant NAG W-2166. The images of these surveys are based on photographic data obtained using the Oschin Schmidt Telescope on Palomar Mountain and the UK Schmidt Telescope. The Oschin Schmidt Telescope is operated by the California Institute of Technology and Palomar Observatory. The UK Schmidt Telescope was operated by the Royal Observatory Edinburgh, with funding from the UK Science and Engineering Research Council (later the UK Particle Physics and Astronomy Research Council), until 1988 June, and thereafter by the Anglo-Australian Observatory. The plates were processed into the present compressed digital form with the permission of these institutions.

The National Geographic Society - Palomar Observatory Sky Atlas was made by the California Institute of Technology with grants from the National Geographic Society. The Second Palomar Observatory Sky Survey was made by the California Institute of Technology with funds from the National Science Foundation, the National Geographic Society, the Sloan Foundation, the Samuel Oschin Foundation, and the Eastman Kodak Corporation.

This research has made extensive use of the NASA/IPAC Extragalactic Database (NED) which is operated by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

References

Arp, H.C. 1966, ApJS, 14, 1

Arp, H.C. & Madore, B.F. 1975, Observatory, 95, 212

Arp, H.C. & Madore, B.F. 1987, "A Catalog of Southern Peculiar Galaxies and Associations," Cambridge University Press.

Barnes, J.E. 1998, in Saas-Fee Advanced Course No. 26, "Galaxies: Interactions and Induced Star Formation", R.C. Kennicutt, Jr., F. Schweizer, & J.E. Barnes (Springer, Berlin), 275

Bosma, A 1991 in "Warped Disks and Inclined Rings Around Galaxies", S. Casertano, P. D. Sackett, & F. H. Briggs (Cambridge University Press, Cambridge)

Bosma, A. 1978 PhD thesis, University of Groningen

Broeils, A.H. 1992, PhD thesis, University of Groningen

Cayatte, V, van Gorkom, J.H., Balkowski, C., & Kotanyi, C. 1990, AJ 100, 604

de Vaucouleurs, G., de Vaucouleurs, A., Corwin, H., Buta, R., Paturel, G., & Fouque, P. 1991, Third Reference Catalogue of Bright Galaxies (Springer, New York) (RC3)

Malin, D.F. & Carter, D. 1983, ApJ, 274, 534

Martin, M.C. 1998, A&AS, 131, 73

Oosterloo, T. 1988, PhD thesis, University of Groningen

Roberts, M.S. & Haynes, M.P. 1994, ARAA, 32, 115

Roberts, M.S. & Rots, A.H. 1973, A&A, 26, 483

Sandage, A. & Tamman, G.A. 1987, "A Revised Shapley Ames Catalog of Bright Galaxies" (Publ. 635; Carnegie Inst. Washington, Washington, DC)

Schweizer, F. & Seitzer, P. 1992, AJ, 104, 1039

Spitzer, Jr., L. 1978, Physical Processes in the Interstellar Medium (John Wiley and Sons, Inc., NYC)

Struck, C. 1999, Phys Rep, 321, 1

Swaters, R. A., 1999, PhD thesis, University of Groningen

Toomre, A. 1977, in The Evolution of Galaxies and Stellar Populations, ed. B.M. Tinsley & R.B. Larson (Yale University Press, New Haven), 401

Toomre, A. & Toomre, J. 1972, ApJ, 405, 142

van Driel, W., & van Woerden, H. 1991, AA, 243, 71

Verheijen, M. A. W., & Sancisi, R. 2001, A&A, 370, 765

Vorontsov-Vel'yaminov, B.A. 1959, "Atlas and Catalogue of Interacting Galaxies" (Moscow).

Vorontsov-Vel'yaminov, B.A. 1977, A&AS, 28, 1

Warmels, R.H. 1988, A&AS, 72, 19

Wevers, B.M.H.R., van der Kruit, P.C., & Allen, R.J. 1986, A&AS 66, 505

Table 1: Rogues Gallery Plan of Arrangement

Fig. No.	Fig. No.	Classification (Abbreviation) (ordering criteria)
1 — 11		**Galaxies with Extended H I Envelopes (ENVL)** (from irregular to regular H I morphology)
12 — 29		**Galaxies with H I Extensions**
	12 — 17	— Two-Sided Warps (**WARP**)
	18 — 27	— One-Sided H I Extensions (**EXT**)
	27 — 29	— Detached H I Clouds (**H Ic**)
30 — 61		**Minor Mergers (mM)** (decreasing separation between galaxies)
	49 — 52	— M51 Types (companion at end of arm) (**mM-m51**)
	52 — 56	— 3-body Encounters (**mM-3**)
	58 — 61	— Minor Merger Remnants (**mMR**)
62 — 111		**Interacting Doubles or Major Mergers** (decreasing separation between galaxies)
	62 — 72	— 2 H I Systems, 2 H I Tails ($\mathbf{Sp^+ - Sp^+}$)
	73 — 78	— 2 H I Systems, 1 H I Tail ($\mathbf{Sp^+ - Sp^0}$)
	79 — 94	— 2 H I Systems, Bridge, No Tails ($\mathbf{Sp^0 - Sp^0}$)
	95 — 106	— 2 Systems, Only 1 with H I ($\mathbf{E - Sp}$)
	107 — 111	— Merger Remnants of Indeterminate Origin (**MR**)
112 — 140		**Peculiar Early Types or Early Types with Peculiar H I**
	112 — 120	— Peculiar Ellipticals with H I Outside the Optical Body (**pecEo**) (from lots of H I to no H I)
	121 — 129	— Peculiar Early Types with H I Within the Optical Body (**pecEi**) (from irregular to disk-like H I morphology)
	130 — 140	— Normal Early Types with Peculiar H I (**EpecH**) (from disk-like to irregular H I morphology)
141 — 143		**Intergalactic Debris with No Optical Counterpart (IGHI)**
145 — 166		**Interacting Triples — Groups — Clusters (TRIP+)** (increasing group membership)
168 — 181		**Miscellaneous (MISC)**

Table 2: H I Rogues Gallery Table of Contents

Table 3: Systems in the H I Rogues Gallery

NGC other other	Arp other other	R.A. [J2000] Dec [J2000] Velocity	Type [NED] Type [RSA] Type [RC3]	Class. Figure No. Page No.
 UGC 12914 MCG +04-01-010	 III Zw 125 VV 254a	00h01m38.20s +23d29m04.2s 4371	(R)S(r)cd:pec:LINER RS.R6*P	**Sp^0 – Sp^0** Fig. 87 p. 775
 UGC 12915 MCG +04-01-011	 III Zw 125 VV 254b	00h01m42.16s +23d29m42.2s 4336	Sc LINER .S?....	**Sp^0 – Sp^0** Fig. 87 p. 775
 UGC 00192 MCG +10-01-001	 IC 0010	00h20m17.30s +59d18m14.0s -348	dIrr .IB.9..	**ENVL** Fig. 5 p. 711
NGC 0092 ESO 194-IG012		00h21m31.369s -48d37m27.99s 3412	SAa: pec .SA.1*P	**TRIP+** Fig. 152 p. 832
NGC 0087 ESO 194-G008		00h21m14.273s -48d37m41.58s 3491	IBm pec .IB.9P.	**TRIP+** Fig. 152 p. 832
NGC 0088 ESO 194-G010		00h21m21.828s -48d38m25.23s 3433	SB(rs)0/a: pec .SBT0*P	**TRIP+** Fig. 152 p. 832
NGC 0089 ESO 194-G011		00h21m24.358s -48d39m56.95s 3320	SB(s)0/a? pec .SBS0?P	**TRIP+** Fig. 152 p. 832
 UGC 00260 MCG +02-02-011	 FGC 0046	00h27m02.90s +11d35m03.0s 2131	Sc .S..6*.	**mM** Fig. 43 p. 737
 AM 0035-335 Cartwheel Galaxy	 VV 784	00h37m41.090s -33d42m58.70s 9050	S pec (Ring)	**Sp^0 – Sp^0** Fig. 90 p. 777
  MCG -02-03-011	ARP 230 PRC B-01 IC 0051	00h46m24.20s -13d26m32.0s 1742	S0 pec? .L...P?	**pecEi** Fig. 128 p. 810
NGC 0262 UGC 00499	 MRK 0348	00h48m47.144s +31d57m25.09s 4507	SA(s)0/a: .SAS0*.	**mM-m51** Fig. 52 p. 745
NGC 0266 UGC 00508		00h49m47.77s +32d16m39.7s 4661	SB(rs)ab .SBT2..	**mM-m51** Fig. 52 p. 745
 UGC 00521 MCG +02-03-008		00h51m12.12s +12d01m32.1s 659	Im .I..9..	**WARP** Fig. 14 p. 719
  Small Magellanic Cloud		00h52m44s -72d49.7m 158	SB(s)m pec	**Sp$^+$ – Sp^0** Fig. 73 p. 764
 UGC 00545 MRK 9009	 I Zw 001 MRK 1502	00h53m34.940s +12d41m36.20s 18330	Compact Sy1 .S?....	**MISC** Fig. 168 p. 846
 IC 1623	ARP 236 VV 114	01h07m47.180s -17d30m25.30s 6016	S pec: HII .S...P*	**MR** Fig. 107 p. 792
 IC 1622 MCG -03-04-001		01h07m37.050s -17d32m22.67s 6343	S?...	**MR** Fig. 107 p. 792

		01h07m20.72s	Dwarf	**MR**
ESO 541-G021		-17d29m59.0s		Fig. 107
		n/a		p. 792
NGC 0474	ARP 227	01h20m06.7s	(R')SA(s)	**pecEo**
UGC 00864		+03d24m55s	S0/a	Fig. 114
MCG +00-04-085		2372	.LAS0..	p. 798
NGC 0470	ARP 227	01h19m44.8s	SA(rs)b	**pecEo**
UGC 00858		+03d24m35s	S(s)bc	Fig. 114
MCG +00-04-084		2374	.SAT3..	p. 798
		01h19m38.3s	n/a	**pecEo**
		+03d15m39s		Fig. 114
MCG +00-04-083		n/a		p. 798
NGC 0520	ARP 157	01h24m34.9s	S pec	**MR**
UGC 00966	VV 231a	+03d47m30	I	Fig. 110
		2281	.P.....	p. 794
	ARP 157	01h24m24.40s	Im:	**MR**
UGC 00957		+03d52m56.0s		Fig. 110
		2152	.I..9*.	p. 794
NGC 0523	Arp 158	01h25m20.80s	Pec	**MR**
NGC 0537	VV 783	+34d01m29.0s		Fig. 108
MCG +06-04-018	IV Zw 045	4758	.P.....	p. 793
NGC 0596		01h32m52.08s	E+ pec:	**pecEo**
		-07d01m54.6s	E0	Fig. 120
MCG -01-05-005		1876	.E+..P*	p. 803
		01h34m00.358s	Sab:	**Sp^0 – Sp^0**
AM 0131-343		-34d23m22.19s		Fig. 88
ESO 353-G014		3809		p. 776
		01h34m04.487s	Sc	**Sp^0 – Sp^0**
AM 0131-344		-34d26m44.31s		Fig. 88
ESO 353-G017		3834		p. 776
NGC 0662		01h44m35.51s	S pec	**MISC**
UGC 01220		+37d41m44.8s		Fig. 176
MCG +06-04-06	V Zw 098	5654	.S...P.	p. 851
NGC 0672		01h47m54.30s	SB(s)cd	**Sp^0 – Sp^0**
UGC 01256	VV 338b	+27d25m59.0s	SB(s)c	Fig. 83
MCG +04-05-011		421	.SBS6..	p. 772
		01h47m29.96s	SB(s)m	**Sp^0 – Sp^0**
UGC 01249	VV 338a	+27d19m58.8s		Fig. 83
MCG +04-05-009	IC 1727	338	.SBS9..	p. 772
NGC 0680		01h49m47.290s	E+ pec:	**pecEi**
UGC 01286		+21d58m15.10s		Fig. 121, 158
MCG +04-05-015		2800	.E+..P*	p. 804, 837
NGC 0678		01h49m25.010s	SB(s)b: sp	**pecEi**
UGC 01280		+21d59m51.10s		Fig. 121, 158
MCG +04-05-014		2835	.SBS3*/	p. 804, 837
NGC 0691		01h50m41.720s	SA(rs)bc	**TRIP+**
UGC 01305		+21d45m35.80s		Fig. 158
MCG +04-05-019		2665	.SAT4..	p. 837
NGC 0694		01h50m58.340s	S0? pec	**TRIP+**
UGC 01310	MRK 0363	+21d59m51.10s		Fig. 158
MCG +04-05-020	V Zw 122	2950	.L...$P	p. 837
	ARP 031	01h51m08.450s	SAB(s)c	**mM**
UGC 01313		+21d54m46.90s		Fig. 34, 158
MCG +04-05-021	IC 0167	2931	.SXS5..	p. 732, 837
NGC 0772	ARP 078	01h59m19.80s	SA(s)b	**mM**
UGC 01466		+19d00m30.0s	S(rs)b	Fig. 38
MCG +03-06-011		2472	.SAS3..	p. 734

NGC 0770 UGC 01463 MCG +03-06-010	ARP 078	01h59m13.480s +18d57m17.00s 2458	`E3:` `.E.3.*.`	**mM** Fig. 38 p. 734
 UGC 01503 MCG +05-05-044		02h01m19.80s +33d19m46.0s 5086	`E` `.E.....`	**MISC** Fig. 177 p. 851
 UGC 01775 MCG +01-06-062	ARP 010 VV 362	02h18m26.359s +05d39m13.81s 9108	`S?`	 Fig. 94 p. 781
NGC 0895 MCG -01-07-002		02h21m36.300s -05d31m15.80s 2288	`SA(s)cd` `S(r)c` `.SAS6..`	**WARP** Fig. 17 p. 721
 AM 0226-320 MCG -05-07-001	 PRC A-02	02h28m20.114s -31d52m51.41s 4604	`S0^0: pec`	**pecEi** Fig. 129 p. 811
NGC 1012 UGC 02141 MCG +05-07-027		02h39m14.96s +30d09m06.0s 987	`S0/a?` `.S..0?.`	**mM** Fig. 32 p. 731
NGC 1023 UGC 02154	ARP 135	02h40m24.000s +39d03m47.80s 637	`SB(rs)0-` `S0B1(5)` `.LBT-..`	**EpecH** Fig. 137 p. 818
NGC 1052 MCG -01-07-034		02h41m04.7984s -08d15m20.750s 1470	`E4;LINER Sy2` `E/S0` `.E.4...`	**EpecH** Fig. 136 p. 817
NGC 1042 MCG -02-07-054		02h40m23.790s -08d26m01.80s 1368	`SAB(rs)cd` `S(rs)c` `.SXT6..`	**EpecH** Fig. 136 p. 817
NGC 1035 MCG -01-07-027		02h39m28.99s -08d07m57.3s 1241	`SA(s)c?` `Sc:` `.SAS5$.`	**EpecH** Fig. 136 p. 817
 4U 0241+61 ZOAG G135.64+02.43		02h44m57.6968s +62d28m06.514s 13191	`Sy1`	**MISC** Fig. 168 p. 846
NGC 1097 UGCA 041 MCG -05-07-024	ARP 077 AM 0244-302	02h46m18.990s -30d16m28.70s 1275	`(R'_1:)SB(r'l)b;Sy1` `SB(rs)bc` `.SBS3..`	**mM-3** Fig. 57 p. 749
NGC 1097A ESO 416-G019 MCG -05-07-022	ARP 077	02h46m09.890s -30d13m40.90s 1368	`E pec:` `SB(rs)bc` `.E...P*`	**mM-3** Fig. 57 p. 749
NGC 1210 AM 0304-255 MCG -04-08-024		03h06m45.33s -25d42m58.9s 3928	`(R')SB(rs)0+ pec` `PLBT+P.`	**pecEi** Fig. 124 p. 806
NGC 1214 HCG 023A MCG -02-08-051		03h06m56.0s -09d32m39s 4869	`SB(rs)0+?` `.LBT+?.`	**TRIP+** Fig. 162 p. 841
NGC 1208 MCG -02-08-047		03h06m11.8s -09d32m27s 4356	`SA(r)0/a?` `.SAR0?.`	**TRIP+** Fig. 162 p. 841
  MCG -02-08-048		03h06m17.3 -09d49m18s n/a	`n/a`	**TRIP+** Fig. 162 p. 841
 MCG -02-08-050 MCG -02-08-050	 HCG 023D	03h06m55.3s -09d37m44s 4467	`Sd`	**TRIP+** Fig. 162 p. 841
 HCG 023:dRC97 10		03h06m56.3 -09d23m10s 20817	`n/a`	**TRIP+** Fig. 162 p. 841

NGC 1215 HCG 023B MCG -02-08-055		03h07m09.4s -09d35m32s 4921	(R)SAB(r)a pec RSXR1P.	**TRIP+** Fig. 162 p. 841
HCG 023:dRC97 26		03h07m09.5s -09d29m16s 5283	n/a	**TRIP+** Fig. 162 p. 841
NGC 1216 HCG 023C MCG -02-08-056		03h07m18.5s -09d36m46s 5373	S0+? sp .L..+?/	**TRIP+** Fig. 162 p. 841
NGC 1241 MCG -02-09-011	ARP 304 VV 334a	03h11m14.71s -08d55m19.9s 4052	SB(rs)b Sy2 SB(s)bc .SBT3..	**mM** Fig. 40 p. 735
NGC 1242 MCG -02-09-012	ARP 304 VV 334b	03h11m19.25s -08d54m06.8s 3961	SB(rs)c: .SBT5*.	**mM** Fig. 40 p. 735
IC 0298 MCG +00-09-015	Arp 147 VV 787 I Zw 011	03h11m18.80s +01d18m57.0s 9656	S0? pec/S pec .RING.A	**E − Sp** Fig. 96 p. 782
NGC 1253 UGCA 062 MCG -01-09-018	ARP 279	03h14m09.11s -02d49m22.2s 1713	SAB(rs)cd .SXT6..	**mM** Fig. 45 p. 738
NGC 1253A DDO 031 MCG -01-09-019	ARP 279 VV 587	03h14m23.33s -02d48m03.0s 1826	SB(s)m .SBS9..	**mM** Fig. 45 p. 738
HCG 026A MCG -02-09-035	VV 491	03h21m55.3s -13d39m01s 9678	Sc	**TRIP+** Fig. 154 p. 833
HCG 26 Ggroup		03h21m54.2s -13d38m45s 9473	n/a	**TRIP+** Fig. 154 p. 833
HCG 026G	VV 491	03h21m55.2s -13d38m54s 9293	S0	**TRIP+** Fig. 154 p. 833
	VV 491	03h21m56.5 -13d38m42s 9133	cI	**TRIP+** Fig. 154 p. 833
HCG 026B	VV 491	03h21m56.9 -13d38m52s 9332	E0	**TRIP+** Fig. 154 p. 833
HCG 026C MCG -02-09-035		03h21m49.5s -13d38m42s 9618	S0	**TRIP+** Fig. 154 p. 833
HCG 026E		03h21m51.1s -13d39m48s 9623	Im	**TRIP+** Fig. 154 p. 833
HCG 026F		03h21m57.6s -13d39m47s 9626	cI	**TRIP+** Fig. 154 p. 833
NGC 1316 MCG -06-08-005 Fornax A	ARP 154 ESO 357-G022	03h22m41.7s -37d12m30s 1760	(R')SAB(s) LINER Sa pec .LXS0P.	**pecEo** Fig. 115 p. 799
NGC 1310 ESO 357-G019 MCG -06-08-004		03h21m03.7s -37d05m58s 1805	SB(rs)cd .SAS5*.	**pecEo** Fig. 115 p. 799
NGC 1317 NGC 1318 Fornax B	 ESO 357-G02 MCG -06-08-0	03h22m44.4s -37d06m13s 1941	(R')SAB(rl)0/ Sa .SXR1..	**pecEo** Fig. 115 p. 799

NGC 1376 MCG -01-10-011		03h37m05.970s -05d02m36.20s 4155	SA(s)cd S(s)c .SAS6..	**ENVL** Fig. 7 p. 713
 SBS 0335-052		03h37m44.04s -05d02m38.5s 4043	BCG	**ENVL** Fig. 7 p. 713
 SBS 0335-052W		03h37m38.46s -05d02m36.3s 4017	dI/BCG	**ENVL** Fig. 7 p. 713
 AM 0352-360 MCG -06-09-037	 IC 2006	03h54m28.530s -35d57m57.60s 1382	E	**EpecH** Fig. 131 p. 813
NGC 1487 AM 0354-423 MCG -07-09-002	 VV 078	03h55m46.51s -42d22m01.6s 848	S pec (merger) S pec .P.....	$\mathbf{Sp^+ - Sp^+}$ Fig. 68 p. 759
NGC 1511 ESO 055-G004 AM 0359-674		03h59m35.73s -67d38m06.6s 1329	SAa pec: Sc pec .SA.1P*	**mM-3** Fig. 56 p. 748
NGC 1511A ESO 055-G005		4h00m19.25s -67d48m27.4s 1291	SB0^0 Sc pec .SB.1?/	**mM-3** Fig. 56 p. 748
NGC 1511B ESO 055-G006		04h00m54.70s -67d36m43.0s 1304	SBd? sp Sc pec .SB.7?/	**mM-3** Fig. 56 p. 748
 UGC 02953 MCG +12-04-011	ARP 213 IC 0356	04h07m46.900s +69d48m44.80s 895	SA(s)ab pec .SAS2P.	**ENVL** Fig. 11 p. 717
NGC 1614	ARP 186 II Zw 015 MRK 0617	04h33m59.854s -08d34m43.98s 4778	SB(s)c pec;HII:Sy2 .SBS5P.	$\mathbf{Sp^+ - Sp^0}$ Fig. 78 p. 769
  Large Magellanic Cloud		05h23m34s -69d45.4m 278	SB(s)m	$\mathbf{Sp^+ - Sp^0}$ Fig. 73 p. 764
 UGCA 116	 II Zw 40	05h55m42.8s +03d23m30s 789	BCD CI...P.	**ENVL** Fig. 6 p. 712
NGC 2207 UGCA 124 MCG -04-15-020		06h16m22.040s -21d22m21.50s 2741	SAB(rs)bc pec S(s)c .SXT4P.	$\mathbf{Sp^0 - Sp^0}$ Fig. 84 p. 773
 UGCA 125 MCG -04-15-021	 IC 2163	06h16m27.830s -21d22m33.30s 2765	SB(rs)c pec .SBT5P.	$\mathbf{Sp^0 - Sp^0}$ Fig. 84 p. 773
NGC 2146 UGC 03429 MCG +13-05-022		06h18m38.61s +78d21m23.9s 893	SB(s)ab pec HII Sb pec .SBS2P.	**mMR** Fig. 61 p. 753
NGC 2146A UGC 03439 MCG +13-05-025		06h23m55.00s +78d31m48.0s 1494	SAB(s)c: Sb pec .SXS5*.	**mMR** Fig. 61 p. 753
 AM 0644-741 Lindsay-Shapley Ring	 VV 785	06h43m06.62s -74d14m16.2s 6604	n/a	**E – Sp** Fig. 97 p. 783
NGC 2292 MCG -04-16-022	 VV 178b	06h47m39.650s -26d44m46.50s 2036	SAB0^0 pec .LX.0P.	**E – Sp** Fig. 98 p. 784
NGC 2293 MCG -04-16-023	 VV 178a	06h47m42.850s -26d45m13.70s 2037	SAB(s)0+ pec .LXS+P.	**E – Sp** Fig. 98 p. 784

NGC 2295		06h47m23.590s	Sab: sp	**E** – **Sp**
		-26d44m10.40s		Fig. 98
MCG -04-16-021		1823	.S..2*/	p. 784
		06h46m46.740s	SB(s)d	**E** – **Sp**
ESO 490-G045		-26d28m31.70s		Fig. 98
MCG -04-16-020		1706	.SBS7..	p. 784
		06h46m37.330s	Sc	**E** – **Sp**
ESO 490-G042		-26d46m50.50s		Fig. 98
		1758		p. 784
NGC 2328		07h02m36.68s	(R') SAB0-	**MISC**
		-42d04m09.0s		Fig. 178
MCG -07-15-002		1168	PLX.-?.	p. 852
	ARP 141	07h14m20.290s	Ring	**TRIP+**
UGC 03730	VV 123a	+73d28m24.40s		Fig. 147
MCG +12-07-035		2728	.RING..	p. 828
		07h12m11.160s	S?	**TRIP+**
UGC 03705		+73d28m14.20s		Fig. 147
MCG +12-07-031		2685	.S?....	p. 828
		07h13m35.02s	I?	**TRIP+**
	KUG 0707+736	+73d35m02.5s		Fig. 147
MCG +12-07-034		n/a	.I?....	p. 828
NGC 2366		07h28m54.66s	IB(s)m	**MISC**
UGC 03851	DDO 042	+69d12m56.8s	SBm (Im)	Fig. 173
MCG +12-07-040		100	.IBS9..	p. 849
NGC 2363		07h28m29.40s	IRR	**MISC**
UGC 03847		+69d11m33.0s		Fig. 173
MCG +12-07-039		70		p. 849
		07h28m41.4s	HII in NGC2366	**MISC**
		+69d11m26s		Fig. 173
	MRK 0071	108		p. 849
NGC 2444	ARP 143	07h46m53.036s	S0 pec	**E** – **Sp**
UGC 04016	VV 117a	+39d01m54.65s		Fig. 103
		4048	.RING.A	p. 788
NGC 2445	ARP 143	07h46m55.10s	Im pec	**E** – **Sp**
UGC 04017	VV117b	+39d00m57.0s		Fig. 103
		4002	.RING.B	p. 788
NGC 2535	ARP 082	08h11m13.49s	SA(r)c pec	**mM-m51**
UGC 04264	VV 009a	+25d12m25.2s		Fig. 49
MCG +04-20-004		4097	.SAR5P.	p. 742
NGC 2536	ARP 082	08h11m15.91s	SB(rs)c pec	**mM-m51**
UGC 04264	VV 009b	+25d10m45.1s		Fig. 49
MCG +04-20-005		4136	.SBT5P.	p. 742
NGC 2534		08h12m54.10s	E1? pec	**pecEi**
UGC 04268		+55d40m19.0s		Fig. 123
MCG +09-14-014	MRK 0085	3447	.E.1.$P	p. 805
NGC 2537	ARP 006	08h13m14.730s	SB(s)m pec	**MISC**
UGC 04274	VV 138	+45d59m26.30s	Sc pec	Fig. 170
BEAR'S PAW	MRK 0086	447	.SBS9P.	p. 847
	ARP 268	08h19m04.00s	Im	**MISC**
UGC 04305	DDO 050	+70d43m09.0s		Fig. 174
Holmberg II	VII Zw 223	157	.I..9..	p. 850
		08h23m40.40s	SB(s)bc	**HIc**
		-60d52m33.0s		Fig. 28
ESO 124-G015		2591	.SBS4..	p. 728
NGC 2623	ARP 243	08h38m24.10s	n/a	**Sp**$^+$ – **Sp**$^+$
UGC 04509	VV 079	+25d45m15.7s		Fig. 69
		5535	.P.....	p. 760

 Ton 951 PG 0844+349		08h47m42.440s +34d45m04.50s 19187	Sy1	**MISC** Fig. 168 p. 846
NGC 2708 NGC 2727 MCG +00-23-015		08h56m08.050s -03d21m36.50s 2008	SAB(s)b pec? .SXS3P?	**mMR** Fig. 58 p. 750
NGC 2709 MCG +00-23-016		08h56m12.863s -03d14m35.57s 1925	SA0^0 pec: .LA.0P*	**mMR** Fig. 58 p. 750
NGC 2782 UGC 04862 MCG +07-19-036	ARP 215	9h14m05.105s +40d06m49.19s 2562	SAB(rs)a pec Sy1 S(s)a pec .SXT1P.	**mMR** Fig. 60 p. 752
NGC 2777 UGC 04823 MCG +01-24-006		09h10m41.822s +07d12m23.49s 1488	Sab? .S..2$.	**mM** Fig. 33 p. 731
 LEDA 213577 A83 U3		09h10m28.40s +07d11m13.0s 1523	n/a	**mM** Fig. 33 p. 731
NGC 2775 UGC 04820 MCG +01-24-005		09h10m20.30s +07d02m17.0s 1354	SA(r)ab S(r)a .SAR2..	**mM** Fig. 33 p. 731
NGC 2768 UGC 04821 MCG +10-13-065		09h11m37.50s +60d02m15.0s 1373	S0_1/2 LINER S02(6) .E.6.*.	**EpecH** Fig. 133 p. 815
 UGC 04808 MCG +10-13-061		09h10m14.60s +59d57m16.0s n/a	Scd: .S..6*.	**EpecH** Fig. 133 p. 815
 MAILYAN 038 LEDA 095604		09h08m59.60s +60d03m45.0s n/a	n/a	**EpecH** Fig. 133 p. 815
NGC 2810 UGC 04954 MCG +12-09-042	 NGC 2810A	09h22m04.500s +71d50m38.90s 3572	E .E.....	**EpecH** Fig. 132 p. 814
NGC 2810B		09h21m58.460s +71d52m00.90s n/a	n/a	**EpecH** Fig. 132 p. 814
 UGC 04951 MRK 0107	 MRK 0020	09h21m43.750s +71d32m39.40s 3525	S? .S?....	**EpecH** Fig. 132 p. 814
 CGCG 332-040 MCG +12-09-037		09h18m49.220s +71d43m51.80s 3520	n/a	**EpecH** Fig. 132 p. 814
 CGCG 332-044		09h21m40.967s +71d40m51.77s 3811	n/a	**EpecH** Fig. 132 p. 814
NGC 2865 AM 0921-225 MCG -04-22-011	 PRC C-29	09h23m30.10s -23d09m43.4s 2627	E3-4 E4 .E.TRIP+..	**pecEi** Fig. 126 p. 808
 FGCE 0745		09h23m40.80s -23d14m46.0s 2480:	Sdm	**pecEi** Fig. 126 p. 808
  SBS 0930+554	 MRK 0116 I Zw 18	09h34m02.0s +55d14m28s 751	Compact	**ENVL** Fig. 4 p. 710
NGC 2964 UGC 05183 MCG +05-23-027	 MRK 0404	09h42m54.240s +31d50m50.30s 1328	SAB(r)bc HII S(s)c .SXR4*.	**TRIP+** Fig. 144 p. 825

NGC 2968 UGC 05190 MCG +05-23-029		09h43m12.010s +31d55m43.80s 1566	`I0` `I` `.I.0...`	**TRIP+** Fig. 144 p. 825
NGC 2970 MCG +05-23-030	 MRK 0405	09h43m31.062s +31d58m37.07s 1618	`E1:` `.E.1.*.`	**TRIP+** Fig. 144 p. 825
 SN 1970L		09h43m20s +31d57.1m n/a	`SN in N2968`	**TRIP+** Fig. 144 p. 825
NGC 2993 MCG -02-25-015	ARP 245	09h45m48.31s -14d22m05.0s 2420	`Sa pec` `Sab` `.S..1P.`	**Sp**$^+$ – **Sp**$^+$ Fig. 64 p. 756
NGC 2992 MCG -02-25-014	ARP 245N	09h45m42.050s -14d19m34.98s 2311	`Sa pec` `Sa` `.S..1P.`	**Sp**$^+$ – **Sp**$^+$ Fig. 64 p. 756
 UGC 05272 MCG +05-23-041	 DDO 064	09h50m22.40s +31d29m16.0s 520	`ImIII` `.I..9..`	**mM** Fig. 37 p. 734
 UGC 05288 MCG +01-25-028		09h51m17.00s +07d49m39.0s 557	`Sdm:` `.S..8*.`	**ENVL** Fig. 10 p. 716
NGC 3044 UGC 05311 MCG +00-25-031	 FGC 0965	09h53m41.10s +01d34m42.0s 1292	`SB(s)c? sp` `Scd` `.SBS5$/`	**MISC** Fig. 180 p. 853
NGC 3031 UGC 05318 MCG +12-10-010	 M 81	09h55m33.173s +69d03m55.06s -34	`SA(s)ab` `S(r)b` `.SAS2..`	**mM-3** Fig. 53 p. 746
NGC 3034 UGC 05322 MCG +12-10-011	ARP 337 M 82	09h55m52.219s +69d40m46.93s 203	`I0` `I` `.I.0../`	**mM-3** Fig. 53 p. 746
NGC 3077 UGC 05398 MCG +12-10-017		10h03m20.30s +68d44m02.0s 14	`I0 pec` `I` `.I.0.P.`	**mM-3** Fig. 53 p. 746
NGC 3079 UGC 05387 MCG +09-17-010		10h01m57.798s +55d40m47.08s 1125	`SB(s)c;LINER Sy2` `Sc pec:` `.SBS5./`	**EXT** Fig. 26 p. 726
NGC 3073 UGC 05374 MCG +09-17-007	 SBS 0957+558 MRK 0131	10h00m52.26s +55d37m05.4s 1217	`SAB0-` `.LX.-..`	**EXT** Fig. 26 p. 726
 CGCG 265-055 MCG +09-17-009		10h01m14.41s +55d43m04.8s 1315	`Sb-Sc`	**EXT** Fig. 26 p. 726
NGC 3104 UGC 05414 MCG +07-21-007	ARP 264 VV 119	10h03m57.35s +40d45m24.9s 603	`IAB(s)m` `.IXS9..`	**MISC** Fig. 171 p. 848
NGC 3227 UGC 05620 MCG +03-27-016	ARP 094 VV 209a	10h23m30.589s +19d51m53.99s 1157	`SAB(s) pec Sy1.5` `S(s)b` `.SXS1P.`	**E** – **Sp** Fig. 104 p. 789
NGC 3226 UGC 05617 MCG +03-27-015	ARP 094 VV 209b	10h23m27.000s +19d53m54.36s 1151	`E2: pec LINER` `S01(1)` `.E.2.*P`	**E** – **Sp** Fig. 104 p. 789
NGC 3239 MCG +03-27-025	Arp 263 VV 095	10h25m05.660s +17d09m37.40s 753	`IB(s)m pec` `.IBS9P.`	**Sp**$^+$ – **Sp**$^+$ Fig. 67 p. 758
NGC 3256 AM 1025-433	 VV 065	10h27m51.82s -43d54m08.7s 2738	`Pec; merger HII` `S(s)b pec` `.P.....`	**Sp**$^+$ – **Sp**$^+$ Fig. 70 p. 761

NGC 3256C AM 1026-433 FAIRALL 0431		10h29m05.70s -43d51m03.0s 2550	SB(rs)d S(s)b pec .SBT7..	**Sp$^+$ – Sp$^+$** Fig. 70 p. 761
NGC 3262		10h29m06.00s -44d09m36.2s 2864	SAB(rs)a .LXT+P.	**Sp$^+$ – Sp$^+$** Fig. 70 p. 761
NGC 3263 AM 1027-435		10h29m13.35s -44d07m22.8s 2842	SB(rs)cd: sp .SBT6*/	**Sp$^+$ – Sp$^+$** Fig. 70 p. 761
 LEDA 083120 ANTLIA GROUP:FS90 212		10h30m20.60s -35d35m32.0s n/a	SmIII	**MISC** Fig. 179 p. 852
NGC 3258B LEDA 083128 ANTLIA GROUP:FS90 222		10h30m25.300s -35d33m48.80s n/a	SAB(r)0:	**MISC** Fig. 179 p. 852
NGC 3273 ANTLIA GROUP:FS90 226 MCG -06-23-045		10h30m29.10s -35d36m39.0s 2419	SA(r)0^0 .LAR0..	**MISC** Fig. 179 p. 852
 UGC 05720 MCG +09-17-070	Arp 233 MRK 0033 Haro 02	10h32m31.93s +54d24m03.5s 1461	Im pec .I..9P*	**ENVL** Fig. 9 p. 715
NGC 3310 UGC 05786 MCG +09-18-008	ARP 217 VV 356 VV 406	10h38m45.90s +53d30m11.7s 993	SAB(r)bc pec HII S(r)bc pec .SXR4P.	**mMR** Fig. 59 p. 751
NGC 3359 UGC 05873 MCG +11-13-037		10h46m36.70s +63d13m27.0s 1014	SB(rs)c HII SB(s)c pec .SBT5..	**HIc** Fig. 29 p. 728
NGC 3368 UGC 05882 MCG +02-28-006	 M 96	10h46m45.740s +11d49m11.80s 897	SAB(rs)ab S(s)ab .SXT2..	**IGHI** Fig. 141 p. 822
NGC 3379 UGC 05902 MCG +02-28-011	 M 105	10h47m49.600s +12d34m54.80s 911	E1 E0 .E.1...	**IGHI** Fig. 141 p. 822
NGC 3371 UGC 05911 MCG +02-28-012	NGC 3384 PRC C-34	10h48m17.020s +12d37m46.60s 704	SB(s)0-:	**IGHI** Fig. 141 p. 822
NGC 3373 UGC 05914 MCG +02-28-013	NGC 3389	10h48m27.900s +12d31m59.90s 1301	SA(s)c .LA..*.	**IGHI** Fig. 141 p. 822
	 Mrk 1263	10h48m56.90s +12d11m42.0s 1430	BCD	**IGHI** Fig. 141 p. 822
 CGCG 066-029		10h49m17.16s +12d25m19.4s 1383	Sm	**IGHI** Fig. 141 p. 822
NGC 3395 UGC 05931 MCG +06-24-017	ARP 270 VV 246b	10h49m50.10s +32d58m59.0s 1625	SAB(rs)cd pec: S(s)c .SXT6P*	**Sp$^+$ – Sp^0** Fig. 75 p. 766
NGC 3396 UGC 05935 MCG +06-24-018	ARP 270 VV 246a	10h49m55.20s +32d59m27.0s 1625	IBm pec Sc .IB.9P.	**Sp$^+$ – Sp^0** Fig. 75 p. 766
 UGC 05927 IC 2604	 VV 538	10h49m25.24s +32d46m21.0s 1633	SB(s)m pec? .SBS9P?	**Sp$^+$ – Sp^0** Fig. 75 p. 766
 IC 2608		10h50m15.50s +32d46m04.8s 1677	Spiral	**Sp$^+$ – Sp^0** Fig. 75 p. 766

NGC 3424		10h51m46.333s	`SB(s)b:?`	$\mathbf{Sp^0} - \mathbf{Sp^0}$
UGC 05972		+32d54m02.74s		Fig. 81
MCG +06-24-025		1494	`.SBS3*$`	p. 771
NGC 3430 IC 2613		10h52m11.92s	`SAB(rs)c`	$\mathbf{Sp^0} - \mathbf{Sp^0}$
UGC 05982		+32d57m06.3s		Fig. 81
MCG +06-24-026		1586		p. 771
NGC 3430A		10h52m44.75s	`n/a`	$\mathbf{Sp^0} - \mathbf{Sp^0}$
		+32d52m31.6s		Fig. 81
		1331		p. 771
		10h52m22.884s	`n/a`	$\mathbf{Sp^0} - \mathbf{Sp^0}$
CG 0072		+32d38m14.26s		Fig. 81
		1541		p. 771
		10h50m49.88s	`n/a`	$\mathbf{Sp^0} - \mathbf{Sp^0}$
MAPS-NGP O_264_0457057		+33d01m05.3s		Fig. 81
		n/a		p. 771
NGC 3432	ARP 206	10h52m31.300s	`SB(s)m;LINER;HII`	**mM**
UGC 05986	VV 011a	+36d37m10.70s	`Sc`	Fig. 41
MCG +06-24-028		616	`.SBS9./`	p. 736
	ARP 206	10h52m16.00s	`DWARF`	**mM**
UGC 05983	VV 011b	+36d35m39.0s		Fig. 41
MCG +06-24-027		n/a		p. 736
NGC 3471		10h59m09.10s	`Sa HII`	**mM**
UGC 06064		+61d31m51.0s		Fig. 39
MCG +10-16-039	MRK 0158	2129	`.S..1..`	p. 735
		10h59m25.10s	`n/a`	**mM**
		+61d33m07.0s		Fig. 39
MCG +10-16-040		n/a		p. 735
		11h01m19.05s	`E+A`	**MISC**
EA1		-12d10m18.0s		Fig. 169
LCRS B105848.9-115409		22375		p. 847
NGC 3561	Arp 105S	11h11m13.204s	`S0^0: pec`	**E** – **Sp**
UGC 06224	VV 237a	+28d41m47.27s		Fig. 102
	Guitar	8804	`.SAR1P.`	p. 787
	ARP 105N	11h11m13.033s	`SA(r)a pec`	**E** – **Sp**
UGC 06224	VV 237c	+28d42m42.73s		Fig. 102
MCG +05-27-011		8783	`.L..0*P`	p. 787
		11h11m13.40s	`E`	**E** – **Sp**
	VV 237b	+28d41m19.0s		Fig. 102
Ambartsumian's Knot		8838		p. 787
		11h11m13.0s	`TDG`	**E** – **Sp**
	VV 237f	+28d46m00s		Fig. 102
		8670		p. 787
NGC 3556		11h11m31.20s	`SB(s)cd`	**mM**
UGC 06225	M 108	+55d40m25.0s	`S(s)c`	Fig. 30
MCG +09-18-098		699	`.SBS6./`	p. 729
		11h12m56.550s	`n/a`	**mM**
		+55d40m59.80s		Fig. 30
MCG +09-19-001		n/a		p. 729
NGC 3610		11h18m25.30s	`E5:`	**pecEo**
UGC 06319		+58d47m11.0s	`E5`	Fig. 120
MCG +10-16-107		1696	`.E.5.*.`	p. 803
NGC 3628	ARP 317	11h20m16.95s	`SAb pec`	**TRIP+**
UGC 06350	VV 308b	+13d35m20.1s	`Sbc`	Fig. 145
MCG +02-29-020		843	`.S..3P/`	p. 826
NGC 3623	ARP 317	11h18m55.90s	`SAB(rs)a`	**TRIP+**
UGC 06328	M 65	+13d05m37.0s	`S(s)a`	Fig. 145
MCG +02-29-018		807	`.SXT1..`	p. 826

NGC 3627	ARP 016,317	11h20m15.02s	`SAB(s)b`	**TRIP+**
UGC 06346	VV 308a	+12d59m29.5s	`S(s)b`	Fig. 145
MCG+02-29-019	M 66	727	`.SXS3..`	p. 826
NGC 3628	ARP 317	11h20m16.95s	`SAb pec sp LINER`	**TRIP+**
UGC 06350	VV 308b	+13d35m20.1s	`Sbc`	Fig. 146
MCG +02-29-020		843	`.S..3P/`	p. 827
NGC 3640		11h21m06.90s	`E3`	**pecEo**
UGC 06368		+03d14m06.0s	`E2`	Fig. 120
MCG +01-29-033		1314	`.E.3...`	p. 803
NGC 3656	ARP 155	11h23m38.4s	`(R')I0: pec LINER`	**pecEi**
UGC 06403		+53d50m31s		Fig. 161, 125
MCG +09-19-063		2869		p. 840, 125
		11h22m23.7s	`n/a`	**TRIP+**
MAPS-NGP O_130_0507168		+53d51m55s		Fig. 161
		3059 (HI)		p. 840
		11h22m25.3s	`n/a`	**TRIP+**
		+53d41m17		Fig. 161
MCG +09-19-052		2944 (HI)		p. 840
		11h23m02.4s	`n/a`	**TRIP+**
		+53d41m45s		Fig. 161
MCG +09-19-056		2796 (HI)		p. 840
		11h23m16.0s	`n/a`	**TRIP+**
		+53d47m14s		Fig. 161
MCG +09-19-059		2796 (HI)		p. 840
		11h24m44.8	`n/a`	**TRIP+**
UGC 06422		+53d44m35s		Fig. 161
		2996 (HI)		p. 840
		11h24m44.8	`n/a`	**TRIP+**
UGC 06422		+53d44m35s		Fig. 161
		2996 (HI)		p. 840
NGC 3664	ARP 005	11h24m25.05s	`SB(s)m pec`	**mM**
UGC 06419	VIII Zw 146	+03d19m33.8s	`SBm (Im)`	Fig. 35
MCG +01-29-041	VV 251	1382	`.SBS9P.`	p. 732
NGC 3664A		11h24m25.10s	`(R)SB(s)m:`	**mM**
UGC 06418		+03d13m21.0s	`SBm (Im)`	Fig. 35
		1326	`RSBS9*.`	p. 732
		11h27m59.90s	`Pec`	**ENVL**
UGC 06456	VV 574	+78d59m39.0s		Fig. 8
MCG +13-08-058	VII Zw 403	-100	`.P.....`	p. 714
NGC 3690	ARP 299B	11h28m30.99s	`SBm? pec`	$\mathbf{Sp^+ - Sp^0}$
UGC 06471	VV 118b	+58d33m40.8s	`S pec`	Fig. 77
MCG +10-17-003	MRK 0171	3064	`.IB.9P.`	p. 768
N3690	ARP 299A	11h28m33.494s	`IBm pec`	$\mathbf{Sp^+ - Sp^0}$
UGC 06472	VV 118a	+58d33m47.32s		Fig. 77
MCG +10-17-005	MRK 0171	3121	`.IB.9P.`	p. 768
	ARP 299C	11h28m27.33s	`Sbrst`	$\mathbf{Sp^+ - Sp^0}$
	VV 118c	+58d34m41.9s		Fig. 77
MCG +10-17-002	IC 694	3111	`.SB.9$P`	p. 768
NGC 3718	ARP 214	11h32m35.270s	`SB(s)a pec Sy1`	**WARP**
UGC 06524	PRC D-18	+53d04m01.40s	`Sa pec?`	Fig. 13
MCG +09-19-114		994	`.SBS1P.`	p. 718
NGC 3729		11h33m49.410s	`SB(r)a pec`	**WARP**
UGC 06547		+53d07m32.30s	`SB pec`	Fig. 13
MCG +09-19-117		1024	`.SBR1P.`	p. 718
NGC 3769	ARP 280	11h37m44.38s	`SB(r)b:`	**mM**
UGC 06595	HOLM 270A	+47d53m28.3s	`SB(s)c`	Fig. 42
MCG +08-21-076		732	`.SBR3*.`	p. 736

NGC 3769A UGC 06595 MCG +08-21-077	ARP 280	11h37m50.50s +47d52m53.0s 761	SBm pec: SB(s)c .SB.9P*	**mM** Fig. 42 p. 736
NGC 3799 UGC 06630	ARP 083 VV 350b	11h40m09.37s +15d19m38.6s 3312	SB(s)b: pec .SBS3*P	**mM** Fig. 44 p. 737
NGC 3800 UGC 06634	ARP 083 VV 350a	11h40m13.510s +15d20m32.60s 3312	SAB(rs)b: pec .SXT3*P	**mM** Fig. 44 p. 737
NGC 3800A		11h40m27.40s +15d24m03.8s 3300	n/a	**mM** Fig. 44 p. 737
NGC 3885 ESO 440-G007 MCG -05-28-006	 AM 1144-273	11h46m46.52s -27d55m22.4s 1802	SAB(r:)0/a: HII Sa .SAS0..	**EXT** Fig. 18 p. 721
NGC 3893 UGC 06778 MCG +08-22-007		11h48m38.18s +48d42m39.5s 977	SAB(rs)c: S(s)c .SXT5*.	**mM-m51** Fig. 50 p. 743
NGC 3896 UGC 06781 MCG +08-22-008		11h48m56.261s +48d40m27.48s 905	SB0/a: pec .SB.0*P	**mM-m51** Fig. 50 p. 743
  MCG +08-22-009		11h49m04.639s +48d44m58.67s n/a	n/a	**mM-m51** Fig. 50 p. 743
NGC 3923 AM 1148-283 MCG -05-28-012		11h51m01.79s -28d48m22.3s 1788	E4-5 E/S01(4) .E.4+..	**pecEo** Fig. 120 p. 803
NGC 3921 UGC 06823 VV 031	ARP 224 I Zw 028 MRK 0430	11h51m06.63s +55d04m45.0s 5838	(R')SA(s)0/a pec PSAS0P.	**E – Sp** Fig. 106 p. 791
NGC 3916 UGC 06819 MCG +09-20-005		11h50m51.00s +55d08m35.9s 5734	SAb: sp .SA.3*/	**E – Sp** Fig. 106 p. 791
  MCG +09-19-213		11h50m32.46s +55d03m28.3s 5482	n/a	**E – Sp** Fig. 106 p. 791
NGC 3958 UGC 06880 MCG +10-17-098		11h54m33.70s +58d22m01.0s 3367	SB(s)a .SBS1..	$\mathbf{Sp^0 - Sp^0}$ Fig. 79 p. 770
NGC 3963 UGC 06884 MCG +10-17-100		11h54m58.720s +58d29m36.40s 3188	SAB(rs)bc SB(rs)c .SXT4..	$\mathbf{Sp^0 - Sp^0}$ Fig. 79 p. 770
NGC 3982 UGC 06918 MCG +09-20-036		11h56m28.102s +55d07m30.58s 1109	SAB(r)b: Sy2 S(r)bc .SXR3*.	**WARP** Fig. 12 p. 717
NGC 3982 UGC 06918 MCG +09-20-036		11h56m28.102s +55d07m30.58s 1109	SAB(r)b: Sy2 S(r)bc .SXR3*.	**WARP** Fig. 12 p. 717
NGC 3977 UGC 06909 MCG +09-20-034	HOLM 304B	11h56m07.2s +55d23m26s 5807	(R)SA(rs)ab: RSAT2*.	**WARP** Fig. 12 p. 717
NGC 3972 UGC 06904 MCG +09-20-032		11h55m45.10s +55d19m14.3s 842	SA(s)bc .SAS4..	**WARP** Fig. 12 p. 717
 UGC 06919 MCG +09-20-037		11h56m37.70s +55d37m58.0s 1357	Sdm: .S..8*.	**WARP** Fig. 12 p. 717

 UGC 06988 MCG +09-20-054		11h59m51.90s +55d39m52.0s n/a	Im: .I..9*.	**WARP** Fig. 12 p. 717
NGC 3992 UGC 06937 MCG +09-20-044	 M 109	11h57m36.10s +53d22m29.2s 1048	SB(rs)bc;LINER;HII SB(rs)b .SBT4..	**MISC** Fig. 181 p. 854
 UGC 6923 MCG +09-20-040	 SBS 1154+534	11h56m49.69s +53d09m37.2s 1066	Im: .I..9*.	**MISC** Fig. 181 p. 854
 UGC 6940 MCG +09-20-045		11h57m47.52s +53d14m04.2s 1108	S? .S?....	**MISC** Fig. 181 p. 854
 UGC 6969 MCG +09-20-048		11h58m47.63s +53d25m29.1s 1111	Im .I..9..	**MISC** Fig. 181 p. 854
NGC 3995 UGC 06944 MCG +06-26-061	ARP 313 VV 249a	11h57m44.070s +32d17m38.80s 3254	SAm pec Sc .SA.9P.	**TRIP+** Fig. 150 p. 830
NGC 3994 UGC 06936	ARP 313 VV 249b	11h57m36.856s +32d16m38.98s 3118	SA(r)c pec? Sbrst .SAR5P$	**TRIP+** Fig. 150 p. 830
NGC 3991 UGC 06933 MCG +06-26-060	 VV 523 HARO 05	11h57m30.80s +32d20m12.1s 3192	Sm (W) + Sc (E) .I..9P/	**TRIP+** Fig. 150 p. 830
 UGC 06925 MCG +05-28-054	 IC 2979	11h56m54.230s +32d09m32.00s 3123	SB0 .LB....	**TRIP+** Fig. 150 p. 830
NGC 3998 UGC 06946 MCG +09-20-046		11h57m56.112s +55d27m12.74s 1040	SA(r)0^0?;Sy1;LIN S01(3) .LAR0$.	**EpecH** Fig. 135 p. 816
NGC 3990 UGC 06938 MCG +09-20-043		11h57m35.559s +55d27m31.21s 696	S0-: sp .L..-*/	**EpecH** Fig. 135 p. 816
NGC 4013 UGC 06963 MCG +07-25-009		11h58m31.290s +43d56m48.80s 834	SAb LINER Sbc: .S..3./	**WARP** Fig. 15 p. 719
 UGC 06973 MCG +07-25-010	 IC 0750	11h58m52.05s +42d43m20.1s 701	Sab: sp Sb .S..2*/	**$Sp^0 - Sp^0$** Fig. 80 p. 770
 UGC 06962 MCG +07-25-008	 IC 0749	11h58m34.02s +42d44m02.1s 784	SAB(rs)cd SB(rs)c .SXT6..	**$Sp^0 - Sp^0$** Fig. 80 p. 770
NGC 4026 UGC 06985 MCG +09-20-052		11h59m25.12s +50d57m42.1s 930	S0 S02(9) .L..../	**EpecH** Fig. 134 p. 815
 UGC 06956 DDO 102		11h58m25.58s +50d55m02.1s 917	SB(s)m .SBS9..	**EpecH** Fig. 134 p. 815
 UGC 06922 MCG +09-20-042		11h56m52.04s +50d48m59.2s 877	Scd .S?....	**EpecH** Fig. 134 p. 815
 UGC 06992 MCG +09-20-059		12h00m18.89s +50d39m08.0s 749	Sdm: .S..8*.	**EpecH** Fig. 134 p. 815
NGC 4027 UGCA 260 VV 066	ARP 022 VIII Zw 158	11h59m30.50s -19d15m44.0s 1671	SB(s)dm S(s)c .SBS8..	**mM** Fig. 36 p. 733

NGC 4027A MCG -03-31-007	ARP 022	1h59m29.27s -19d19m52.3s 1747	`IB(s)m:` `S(s)c` `.IBS9*.`	**mM** Fig. 36 p. 733
  ESO 572-G045		12h01m09.50s -19d04m48.0s n/a	`Scd`	**EXT** Fig. 22, 65 p. 724, 757
 ESO 572-G045		12h01m09.50s -19d04m48.0s n/a	`Scd`	**EXT** Fig. 22 p. 724
NGC 4038 UGCA 264 MCG -03-31-014	ARP 244 VV 245b	12h01m52.82s -18d51m54.3s 1642	`SB(s)m pec` `Sc pec` `.SBS9P.`	**Sp**$^{+}$ – **Sp**$^{+}$ Fig. 65 p. 757
NGC 4039 UGCA 265 MCG -03-31-015	ARP 244 VV 245a	12h01m53.82s -18d53m06.3s 1641	`SA(s)m pec` `.SAS9P.`	**Sp**$^{+}$ – **Sp**$^{+}$ Fig. 65 p. 757
NGC 4088 UGC 07081 MCG +09-20-089	ARP 018 VV 357	12h05m34.22s +50d32m21.2s 760	`SAB(rs)bc` `SAB(s)c` `.SXT4..`	**mM-3** Fig. 55 p. 748
NGC 4085 UGC 07075 MCG +09-20-086		12h05m22.70s +50d21m12.2s 752	`SAB(s)c:?` `Sc` `.SXS5*$`	**mM-3** Fig. 55 p. 748
  MCG +09-20-092		12h03m29.55s +50d46m34.7s n/a	`ImIII/BCD`	**mM-3** Fig. 55 p. 748
NGC 4111 UGC 07103 MCG +07-25-026		12h07m03.17s +43d03m55.3s 807	`SA(r)0+: sp HII` `S01(9)` `.LAR+*/`	**EpecH** Fig. 138 p. 819
NGC 4117 UGC 07112 MCG +07-25-027		12h07m46.121s +43d07m34.99s 943	`S0^0: Sy2` `.L..0*.`	**EpecH** Fig. 138 p. 819
NGC 4118 UGC 07112 NOTES01 MCG +07-25-028		12h07m52.79s +43d06m40.4s 661	`S0+?` `.L..+$.`	**EpecH** Fig. 138 p. 819
 UGC 7089 MCG +07-25-020		12h05m58.10s +43d08m43.0s 776	`Sdm:` `.S..8*.`	**EpecH** Fig. 138 p. 819
 UGC 7094 MCG +07-25-022		12h06m10.91s +42d57m23.2s 780	`Sdm:` `.S..8*.`	**EpecH** Fig. 138 p. 819
  MCG +07-25-025		12h07m03.75s +42d59m03.0s n/a	`n/a`	**EpecH** Fig. 138 p. 819
NGC 4109 CGCG 215-027 MCG +07-25-024	HOLM 333B	12h06m51.1s +42d59m44s 7038	`Sa?` `.S..1$.`	**EpecH** Fig. 138 p. 819
NGC 4125 UGC 07118 MCG +11-15-027		12h08m05.860s +65d10m26.80s 1356	`E6 pec LINER` `E6` `.E.6.P.`	**pecEo** Fig. 116 p. 800
NGC 4382 UGC 07508 MCG +03-32-029	 M 85	12h25m24.040s +18d11m25.90s 729	`SA(s)0+ pec` `S01(3) pec` `.LAS+P.`	**pecEo** Fig. 119 p. 802
 IC 3292		12h24m48.338s +18d11m42.04s 710	`dS0`	**pecEo** Fig. 119 p. 802
 VCC 797 MCG +03-32-028		12h25m24.10s +18d08m23.0s 773	`E?` `.E?....`	**pecEo** Fig. 119 p. 802

NGC 4394 UGC 07523 MCG +03-32-035		12h25m55.630s +18d12m50.20s 922	(R)SB(r)b SB(sr)b RSBR3..	**pecEo** Fig. 119 p. 802
NGC 4406 M 86 MCG +02-32-046		12h26m11.7s +12d56m46s -244	S0(3)/E3 S0/E1(3) .E.3...	**pecEo** Fig. 118 p. 801
NGC 4387 UGC 07517 MCG +02-32-039		12h25m41.7s +12d48m38s 561	E5 .E.....	**pecEo** Fig. 118 p. 801
NGC 4402 UGC 07528 MCG +02-32-044		12h26m07.7s +13d06m48s 232	Sb .S..3./	**pecEo** Fig. 118 p. 801
NGC 4407 UGC 07538 MCG +02-32-049		12h26m32.2s +12d36m40s 102	(R')SB(rs)ab:	**pecEo** Fig. 118 p. 801
NGC 4410A UGC 07535 MCG +02-32-047	 MRK 1325	12h26m28.20s +09d01m10.0s 7352	Sab? pec .S..2?P	**TRIP+** Fig. 160 p. 839
NGC 4410B UGC 07535 MCG +02-32-047	 MRK 1325	12h26m29.67s +09d01m08.6s 7566	S0? pec .L...?P	**TRIP+** Fig. 160 p. 839
NGC 4410C IC 790 MCG +02-32-051	 VCC 0919	12h26m35.491s +09d02m07.24s 7525	S0?	**TRIP+** Fig. 160 p. 839
NGC 4410D VCC 934 MCG +02-32-054		12h26m44.26s +09d02m55.0s 6938	SBa(s)	**TRIP+** Fig. 160 p. 839
NGC 4410F MAPS-NGP O_496_0203340		12h26m40.81s +09d00m53.4s 7206	n/a	**TRIP+** Fig. 160 p. 839
 VCC 822		12h25m39.41s +08d54m42.9s 6898	SBc	**TRIP+** Fig. 160 p. 839
 VCC 847		12h25m50.99s +08d55m14.4s 7556	SBc	**TRIP+** Fig. 160 p. 839
NGC 4410H VCC 961		12h26m59.201s +08d57m31.26s 7342	SB0	**TRIP+** Fig. 160 p. 839
NGC 4410E MAPS-NGP O_496_0203404		12h26m31.644s +09d07m22.84s 7355	S	**TRIP+** Fig. 160 p. 839
 FGC 170A		12h27m07.80s +09d13m07.3s 7620	S	**TRIP+** Fig. 160 p. 839
 VCC 0831		12h25m42.98s +09d01m34.4s 7507	Sc	**TRIP+** Fig. 160 p. 839
 IC 3355 MCG +02-32-056	 VV 511 DDO 124	12h26m51.1s +13d10m33s 162	Im .I..9..	**EXT** Fig. 23 p. 724
NGC 4388 UGC 07520 MCG +02-32-041		12h25m46.7s +12d39m44s 2524	SA(s)b: sp Sy2 Sab .SAS3*/	**EXT** Fig. 23 p. 724
NGC 4425 UGC 07562 MCG +02-32-059		12h27m13.3s +12d44m05s 1866	SB0+: sp S0B pec .LB.+*/	**EXT** Fig. 23 p. 724

		12h27m41.847s	`S?`	**EpecH**
UGC 07576	PRC A-04	+28d41m52.69s		Fig. 130
MCG +05-29-086		7022	`.S?....`	p. 812
NGC 4438	ARP 120	12h27m45.6s	`SA(s)0/a pec:LINER`	**EXT**
UGC 07574	VV 188	+13d00m32s	`Sb`	Fig. 25
MCG +02-32-065		71	`.SASOP*`	p. 725
NGC 4435	ARP 120	12h27m40.5s	`SB(s)0^0;LINER;HII`	**EXT**
UGC 07575		+13d04m44s	`S0B1(7)`	Fig. 25
MCG +02-32-064		801	`.LBS0..`	p. 725
NGC 4449		12h28m11.20s	`IBm HII`	**ENVL**
UGC 07592		+44d05m36.0s	`Sm (Im)`	Fig. 3
MCG +07-26-009		207	`.IB.9..`	p. 709
		12h27m40.90s	`Im`	**ENVL**
UGC 07577		+43d29m44.0s		Fig. 3
DDO 125		196	`.I..9..`	p. 709
NGC 4490	ARP 269	12h30m36.10s	`SB(s)d pec`	**mM**
UGC 07651	VV 030	+41d38m34.0s	`Scd pec`	Fig. 47
MCG +07-26-014		565	`.SBS7P.`	p. 740
NGC 4485	ARP 269	12h30m31.25s	`IB(s)m pec HII`	**mM**
UGC 07648	VV 030b	+41d41m58.2s	`S`	Fig. 47
		493	`.IBS9P.`	p. 740
	VV 788	12h32m04.80s	`RING`	
UGC 07683		+66d24m11.0s		Fig. 93
VII Zw 466		14490		p. 780
G4		12h31m35.110s	`n/a`	
		+66d26m55.26s		Fig. 93
		14223		p. 780
G3		12h31m37.990s	`n/a`	
		+66d22m35.56s		Fig. 93
		14046		p. 780
G2		12h32m11.760s	`n/a`	
		+66d23m21.80s		Fig. 93
		14457		p. 780
	G1	12h32m13.298s	`n/a`	
UGC 07683		+66d23m58.81s		Fig. 93
VII Zw 467		14100		p. 780
NGC 4522		12h33m39.83s	`SB(s)cd: sp`	**EXT**
UGC 07711	VCC 1516	+09d10m30.9s	`Sbc:`	Fig. 24
MCG +02-32-137		2337	`.SBS6*/`	p. 725
NGC 4532		12h34m19.33s	`IBm`	**IGHI**
UGC 07726	VCC 1554	+06d28m07.2s	`Sm (Im)`	Fig. 143
MCG +01-32-103		2012	`.IB.9..`	p. 824
		12h34m45.30s	`Im`	**IGHI**
UGC 07739	DDO 137	+06d18m02s		Fig. 143
Holmberg VII	VCC 1581	2039	`.I..9..`	p. 824
NGC 4631	ARP 281	12h42m08.00s	`SB(s)d`	**mM-3**
UGC 07865		+32d32m26.0s	`Sc`	Fig. 54
MCG +06-28-020		606	`.SBS7./`	p. 747
NGC 4627	ARP 281	12h41m59.676s	`E4 pec`	**mM-3**
UGC 07860		+32d34m24.78s		Fig. 54
MCG +06-28-019		765	`.E.4.P.`	p. 747
		12h43m07.02s	`n/a`	**mM-3**
		+32d29m27.0s		Fig. 54
MCG +06-28-022		899		p. 747
NGC 4656		12h43m57.73s	`n/a`	**mM-3**
UGC 07907		+32d10m05.3s	`I`	Fig. 54
MCG +05-30-066		646	`.SBS9P.`	p. 747

NGC 4657 UGC 07907 MCG +05-30-066	 NGC 4656 	12h44m07.097s +32d12m31.47s n/a	`n/a` `I` `.SBS9P.`	**mM-3** Fig. 54 p. 747
NGC 4654 UGC 07902 MCG +02-33-004		12h43m56.570s +13d07m35.90s 1037	`SAB(rs)cd` `SB(rs)c` `.SXT6..`	**EXT** Fig. 21 p. 723
NGC 4639 UGC 07884 MCG +02-32-189		12h42m52.390s +13d15m27.10s 1010	`SAB(rs)bc Sy1.8` `SB(r)b` `.SXT4..`	**EXT** Fig. 21 p. 723
NGC 4676A UGC 07938 MCG +05-30-076	ARP 242 VV 224a IC 0819	12h46m10.074s +30d43m55.25s 6613	`Irr` `.L...P$`	**Sp**$^+$ – **Sp**$^+$ Fig. 66 p. 758
NGC 4676B UGC 07939 MCG +05-30-077	ARP 242 VV 224b IC 0820	12h46m11.310s +30d43m23.01s 6607	`SB(s)0/a pec` `.SBS0P.`	**Sp**$^+$ – **Sp**$^+$ Fig. 66 p. 758
NGC 4676S KUG 1244+307		12h46m27.127s +30d30m56.64s 6600	`Compact`	**Sp**$^+$ – **Sp**$^+$ Fig. 66 p. 758
NGC 4861 UGC 08098 MCG +06-29-003	ARP 266 I Zw 049 IC 3961	12h59m01.78s +34d51m39.7s 847	`SB(s)m: Sbrst` `SBm (Im)` `.SBS9*.`	**H Ic** Fig. 27 p. 727
 UGC 08201 DDO 165	 VII Zw 499 	13h06m24.85s +67d42m25.0s 37	`Im` `.I..9..`	**MISC** Fig. 172 p. 848
NGC 5018 UGCA 335 MCG -03-34-017		13h13m00.99s -19d31m05.1s 2794	`E3:` `E4` `.E.3.*.`	**pecEo** Fig. 113 p. 797
NGC 5022 FGC 1581 MCG -03-34-021		13h13m30.66s -19d32m47.1s 3001	`SBb pec sp`	**pecEo** Fig. 113 p. 797
 ESO 576-G008 MCG -03-34-013		13h12m18.80s -19d26m44.7s 2691	`S0? sp` `.L...?/`	**pecEo** Fig. 113 p. 797
 LEDA 140148		13h12m47.90s -19d22m20.0s n/a	`n/a`	**pecEo** Fig. 113 p. 797
 LEDA 140150		13h13m54.30s -19d24m59.0s n/a	`n/a` `.L...?/`	**pecEo** Fig. 113 p. 797
 LEDA 140148		13h12m47.90s -19d22m20.0s n/a	`n/a`	**pecEo** Fig. 113 p. 797
 LEDA 140150		13h13m54.30s -19d24m59.0s n/a	`n/a`	**pecEo** Fig. 113 p. 797
 UGC 08331 MCG +08-24-097	 DDO 169 	13h15m30.31s +47d29m56.2s 260	`IAm` `.IA.9..`	**EXT** Fig. 19 p. 722
 UGC 08387 IC 0883	ARP 193 VV 821 I Zw 056	13h20m35.343s +34d08m22.19s 7000	`Im: pec` `.I..9*P`	**Sp**$^+$ – **Sp**$^+$ Fig. 71 p. 762
NGC 5128 AM 1322-424 Centaurus A	ARP 153 MCG -07-28-001	13h25m27.6152s -43d01m08.805s 547	`S0 pec Sy2` `S0` `.L...P.`	**pecEi** Fig. 127 p. 809
NGC 5194 UGC 08493	ARP 085 VV 001a,403 M 51a	13h29m52.711s +47d11m42.62s 463	`SA(s)bc pec` `S(s)bc` `.SAS4P.`	**mM-m51** Fig. 51 p. 744

NGC 5195	ARP 085	13h29m58.73s	SB0_1 pec	**mM-m51**
UGC 08494	VV 001b	+47d16m04.5s	S0B1 pec	Fig. 51
	M 51b	465	.I.0.P.	p. 744
NGC 5198		13h30m11.420s	E1-2:	**TRIP+**
UGC 08499	I Zw 059	+46d40m14.20s	E1	Fig. 163
MCG +08-25-015		2533	.E.1+*.	p. 841
NGC 5169		13h28m10.040s	SB(rs)b:	**TRIP+**
UGC 08465		+46d40m19.60s		Fig. 163
MCG +08-25-004		2436	.SBT3*.	p. 841
NGC 5173		13h28m25.296s	E0:	**TRIP+**
UGC 08468		+46d35m29.56s		Fig. 163
MCG +08-25-005		2419	.E.0.*.	p. 841
		13h28m33.28s	SB(s)d: sp	**TRIP+**
UGC 08470	IC 4263	+46d55m36.2s		Fig. 163
MCG +08-25-007		454	.SBS7*/	p. 841
		13h28m33.630s	n/a	**TRIP+**
		+46d29m59.30s		Fig. 163
MCG +08-25-006		n/a		p. 841
		13h29m15.360s	n/a	**TRIP+**
CGCG 246-006		+46d30m08.40s		Fig. 163
MCG +08-25-010		n/a		p. 841
NGC 5216	ARP 104	13h32m06.90s	E0 pec	**E – Sp**
UGC 08528	VV 033a	+62d42m02.0s		Fig. 101
MCG +11-17-004		2955	.E.0.P.	p. 786
NGC 5218	ARP 104	13h32m10.30s	SB(s)b? pec	**E – Sp**
UGC 08529	VV 033b	+62d46m04.0s		Fig. 101
MCG +11-17-005		***	.SBS3$P	p. 786
NGC 5236		13h37m00.78s	SAB(s)c	**ENVL**
UGCA 366	M 83	-29d51m58.6s	SB(s)c	Fig. 2
MCG -05-32-050		516	.SXS5..	p. 708
		13h44m42.111s	Ring galaxy	**E – Sp**
UGC 08696	VV 851	+55d53m12.65s		Fig. 105
MRK 0273	I Zw 071	11326	.P.....	p. 790
NGC 5291		13h47m24.42s	E pec:	**IGHI**
AM 1344-301		-30d24m28.0		Fig. 142
MCG -05-33-006		4386	.E...P*	p. 823
		13h47m23.34s	S0	**IGHI**
AM 1344-301		-30d25m01.0s		Fig. 142
MCG -05-33-005		4310		p. 823
		13h47m12.17s	S	**IGHI**
ABELL 3574:R84 0435		-30d27m24.5s		Fig. 142
		4088		p. 823
		13h47m20.5s	HII	**IGHI**
CTS 1032		-30d20m33s		Fig. 142
		4350		p. 823
		13h47m17.18s	LSBG	**IGHI**
ABELL 3574:TPD93 267		-30d27m01.4s		Fig. 142
		n/a		p. 823
NGC 5322		13h49m15.190s	E3-4 LINER	**pecEo**
UGC 08745		+60d11m26.50s	E4	Fig. 120
MCG +10-20-035		1781	.E.TRIP+..	p. 803
		13h57m13.930s	(R:)SAB(r)0/a	**E – Sp**
AM 1354-250	ESO 510-G022	-25d14m45.10s		Fig. 95
MCG -04-33-019	IC 4350	6200		p. 782
NGC 5395	ARP 084	13h58m38.130s	SA(s)b pec	**mM**
UGC 08900	I Zw 077	+37d25m29.90s	Sb	Fig. 46
MCG +06-31-034	VV 048a	3491	.SAS3P.	p. 739

NGC 5394 UGC 08898 MCG +06-31-033	ARP 084 VV 048b MRK 1508	13h58m33.652s +37d27m12.55s 3472	SB(s)b pec .SBS3P.	**mM** Fig. 46 p. 739
NGC 5426 UGCA 380	ARP 271 VV 021b	14h03m25.10s -06d04m09.1s 2621	SA(s)c pec S(rs)bc .SAS5P.	**Sp^0 – Sp^0** Fig. 85 p. 774
NGC 5427 UGCA 381 MCG -01-36-003	ARP 271 VV 021a	14h03m26.09s -06d01m50.8s 2618	SA(s)c pec S(s)bc .SAS5P.	**Sp^0 – Sp^0** Fig. 85 p. 774
NGC 5506 UGCA 387 MCG +00-36-028	 MRK 1376	14h13m14.866s -03d12m26.95s 1853	Sa pec sp Sy1.9 .S..1P/	**E – Sp** Fig. 151, 99 p. 831, 785
NGC 5507 UGCA 388 MCG +00-36-029		14h13m19.862s -03d08m56.37s 1852	SAB(r)0^0 .LXR0..	**TRIP+** Fig. 151 p. 831
APMUKS(BJ) B141006.54-025604.4		14h12m42.24s -03d10m06.4s n/a	n/a	**TRIP+** Fig. 151 p. 831
APMUKS(BJ) B141048.34-025756.0		14h13m24.07s -03d11m56.3s n/a	n/a	**TRIP+** Fig. 151 p. 831
APMUKS(BJ) B141146.90-024757.6		14h14m22.54s -03d01m55.6s 1853	Scd	**TRIP+** Fig. 151 p. 831
NGC 5713 UGC 09451 MCG +00-37-022	 VIII Zw 447	14h40m11.31s -00d17m26.8s 1883	SAB(rs)bc pec S(s)bc pec .SXT4P.	**Sp$^+$ – Sp$^+$** Fig. 62 p. 754
NGC 5719 UGC 09462 MCG +00-37-024		14h40m56.43s -00d19m07.5s 1743	SAB(s)ab pec .SXS2P.	**Sp$^+$ – Sp$^+$** Fig. 62 p. 754
 UGC 09560 MCG +06-33-002	VV 324b MRK 0829 II Zw 70	14h50m56.5s +35d34m18s 1215	pec BCD .P.....	**Sp^0 – Sp^0** Fig. 91 p. 778
 UGC 09562 MCG +06-33-004	PRC B-17 VV 324a II Zw 71	14h51m14.38s +35d32m31.5s 1292	Pec .P.....	**Sp^0 – Sp^0** Fig. 91 p. 778
NGC 5775 UGC 09579 MCG +01-38-014		14h53m57.50s +03d32m42.0s 1681	SBc? sp Sc .SB.5$/	**Sp^0 – Sp^0** Fig. 82 p. 771
NGC 5774 UGC 09576 MCG +01-38-013		14h53m42.60s +03d34m59.0s 1567	SAB(rs)d .SXT7..	**Sp^0 – Sp^0** Fig. 82 p. 771
IC 1070		14h53m51.273s +03d29m04.70s 1677	Sbc	**Sp^0 – Sp^0** Fig. 82 p. 771
NGC 5903 UGCA 405 MCG -04-36-008	 AM 1515-235	15h18m36.30s -24d04m05.9s 2565	E2 E/S01(3) .E.2...	**EpecH** Fig. 140 p. 821
NGC 5898 UGCA 404 MCG -04-36-006	 AM 1515-235	15h18m13.60s -24d05m51.0s 2122	E0 S04(0) .E.0...	**EpecH** Fig. 140 p. 821
ESO 512-G003		14h34m20.72s -24d44m01.5s n/a	S...	**EpecH** Fig. 140 p. 821
NGC 5915 UGCA 407 MCG -02-39-019		15h21m33.10s -13d05m30.7s 2272	SB(s)ab pec SB(s)bc pec .SBS2P.	**TRIP+** Fig. 148 p. 829

NGC 5916		15h21m37.78s	SB(rs)a pec	**TRIP+**
		-13d10m09.4s		Fig. 148
MCG -02-39-020		2302	.SBT1P.	p. 829
NGC 5916A		15h21m13.60s	SB(s)c pec	**TRIP+**
		-13d06m00.8s		Fig. 148
MCG -02-39-018		2292	.SBS5P.	p. 829
	ARP 220	15h34m57.116s	S?	**MR**
UGC 09913	VV 540	+23d30m11.47s		Fig. 111
IC 1127	IC 4553	5434	.S?....	p. 795
	ARP 002	16h16m18.34s	SB(s)m	**MISC**
UGC 10310	DDO 204	+47d02m47.1s		Fig. 175
MCG +08-30-002		716	.SBS9..	p. 850
NGC 6239		16h50m05.59s	SB(s)b pec?	**mM**
UGC 10577		+42d44m19.8s	SBc pec	Fig. 31
MCG +07-35-001		923	.SBS3P$	p. 730
NGC 6240	IC 4625	16h52m58.89s	I0: pec;LINER Sy2	**MR**
UGC 10592	VV 617	+02d24m03.4s		Fig. 109
		7339	.I.0.*P	p. 793
	ARP 102	17h19m14.477s	E0+Sb	**E – Sp**
UGC 10814	VV 010	+48d58m49.48s		Fig. 100
MCG +08-31-041		7245/7217	.SX.3P.	p. 786
		17h29m17s	n/a	$\mathbf{Sp^0 - Sp^0}$
AM 1724-622		-62d27.8m		Fig. 92
Sacred Mushroom		n/a		p. 779
		17h29m09.41s	Rings	$\mathbf{Sp^0 - Sp^0}$
ESO 138-IG029		-62d26m44.5s		Fig. 92
		4641	RLXS+P.	p. 779
		17h29m25.62s	SB(s)ab? pec	$\mathbf{Sp^0 - Sp^0}$
ESO 138-IG030		-62d28m53.5s		Fig. 92
		4800	.SBS2?P	p. 779
		18h01m09.030s	Sy2	**MISC**
IRAS 17596+4221		+42d21m43.40s		Fig. 168
CGCG 227-012		15769		p. 846
		18h12m32.242s	SBdm	**EXT**
UGC 11152		+18d35m56.14s		Fig. 20
MCG +03-46-018		2727	.SB.8..	p. 722
NGC 6670B		18h33m33.79s	HII	$\mathbf{Sp^+ - Sp^0}$
UGC 11284	VII Zw 812	+59d53m16.4s		Fig. 76
MCG +10-26-044		8428		p. 767
NGC 6670A		18h33m37.33s	S HII	$\mathbf{Sp^+ - Sp^0}$
UGC 11284	VII Zw 812	+59d53m22.2s		Fig. 76
		8719		p. 767
		18h34m12.90s	n/a	$\mathbf{Sp^+ - Sp^0}$
CGCG 301-032		+59d51m36.0s		Fig. 76
		8699		p. 767
NGC 6845		20h00m58.28s	GGroup	**TRIP+**
AM 1957-471		-47d04m11.9s		Fig. 153
Klemola 30		6359	.SBS3*P	p. 832
NGC 6845D		20h00m53.590s	S pec sp	**TRIP+**
		-47d05m42.80s		Fig. 153
		6816	.L..*P/	p. 832
NGC 6845C		20h00m56.810s	S pec sp	**TRIP+**
		-47d05m03.20s		Fig. 153
		7070	.L.+*P/	p. 832
NGC 6845A		20h00m58.090s	SB(s)b: pec	**TRIP+**
		-47d04m14.00s		Fig. 153
		6399	.SBS3*P	p. 832

NGC 6845B		20h01m05.300s	SBb? pec	**TRIP+**
		-47d03m32.70s		Fig. 153
		6746	.SB.3?P	p. 832
		21h02m31.20s	SA(s)cd:	**WARP**
UGCA 419		-16d49m03.0s		Fig. 16
MCG -03-53-021	IC 5078	1474	.SAS5*.	p. 720
NGC 7125		21h49m15.566s	SAB(s)c	$\mathbf{Sp^0 - Sp^0}$
ESO 145-G017		-60d42m39.04s	S(rs)c	Fig. 89
AM 2145-605		3148	.SXT5..	p. 777
NGC 7126		21h49m18.648s	SAB:(rs:)bc	$\mathbf{Sp^0 - Sp^0}$
ESO 145-G018		-60d36m29.31s	S(r)a:	Fig. 89
AM 2145-605		2981	.SAT5..	p. 777
NGC 7135		21h49m45.559s	SA0- pec AGN	**pecEo**
AM 2146-350		-34d52m32.73s	S01 pec	Fig. 112
MCG -06-48-001		2640	.LA.-P.	p. 796
NGC 7172		22h02m01.684s	SA pec	**TRIP+**
AM 2159-320		-31d52m18.12s		Fig. 165
MCG -05-52-007	HCG 090A	2603	.S..1P/	p. 843
NGC 7173		22h02m03.383s	E+ pec:	**TRIP+**
UGCA 422	VV 698	-31d58m26.92s		Fig. 165
MCG -05-52-008	HCG 090C	2497	.E+..P*	p. 843
NGC 7174		22h02m06.820s	Sab pec	**TRIP+**
	VV 698	-31d59m36.53s		Fig. 165
MCG -05-52-010	HCG 090D	2659	.S..2P/	p. 843
NGC 7176		22h02m08.454s	E pec:	**TRIP+**
UGCA 423	VV 698	-31d59m29.52s		Fig. 165
MCG -05-52-011	HCG 090B	2511	.E...P*	p. 843
NGC 7213		22h09m16.250s	SA(s)0^0 Sy1.5	**ENVL**
AM 2206-472		-47d10m00.00s	S(rs)a	Fig. 1
		1792	.SAS1*.	p. 707
		22h17m12.261s	Compact Sy1	**MISC**
PG 2214+139	II Zw 175	+14d14m21.06s		Fig. 168
	MRK 0304	19715		p. 846
NGC 7252	ARP 226	22h20m44.770s	(R)SA(r)0^0:	$\mathbf{Sp^+ - Sp^+}$
AM 2217-245		-24d40m42.93s		Fig. 72
		4688	RLAR0*.	p. 763
NGC 7252 COM01		22h21m19.93s	n/a	$\mathbf{Sp^+ - Sp^+}$
		-24d31m26.6s		Fig. 72
		4797		p. 763
NGC 7426		22h56m02.870s	E	**EpecH**
UGC 12256		+36d21m40.90s		Fig. 139
		5325	.E.....	p. 820
		22h54m50.10s	S?	**EpecH**
UGC 12248		+36d32m33.0s		Fig. 139
		4880	.S?....	p. 820
		22h56m24.920s	n/a	**EpecH**
CGCG 515-013		+36d14m29.10s		Fig. 139
		5082		p. 820
	ARP 314	22h58m01.01s	(R')SA(s)bc: pec	**TRIP+**
	VV 295a	-03d46m07.7s		Fig. 149
MCG -01-58-009		3687	PSAS4*P	p. 829
	ARP 314	22h58m07.02s	SB(rs)cd: pec	**TRIP+**
	VV 295b	-03d47m22.6s		Fig. 149
MCG -01-58-010		3673	.SBT6*P	p. 829
	ARP 314	22h58m07.25s	(R')SB(s)dm pec	**TRIP+**
	VV 295c	-03d48m39.1s		Fig. 149
MCG -01-58-011		3701	PSBS8P.	p. 829

NGC 7464 UGC 12315 MCG +03-58-023	 ARK 573 	23h01m53.72s +15d58m25.4s 1875	E1 pec: .E.1.P*	**mM** Fig. 48 p. 741
NGC 7463 UGC 12316 MCG +03-58-022		23h01m51.980s +15d58m54.50s 2341	SABb: pec .SX.3*P	**mM** Fig. 48 p. 741
NGC 7465 UGC 12317 MCG +03-58-024	 MRK 0313	23h02m00.960s +15d57m53.40s 1968	(R')SB(s)0^0: Sy2 PLBS0*.	**mM** Fig. 48 p. 741
NGC 7469 UGC 12332 MCG +01-58-025	ARP 298 MRK 9003 MRK 1514	23h03m15.623s +08d52m26.39s 4892	(R')SAB(rs)a Sy1.2 Sab pec PSXT1..	$\mathbf{Sp^0 - Sp^0}$ Fig. 86 p. 775
 UGC 12332 MCG +01-58-026	ARP 298 IC 5283 	23h03m17.70s +08d53m37.0s 4804	SA(r)cd pec? Sy? PSXT1..	$\mathbf{Sp^0 - Sp^0}$ Fig. 86 p. 775
	 Mrk 315 II Zw 187	23h04m02.622s +22d37m27.53s 11653	E1 pec? .E.1.P$	**pecEi** Fig. 122 p. 805
NGC 7585 MCG -01-59-015	ARP 223	23h18m01.32s -04d39m00.5s 3447	(R')SA(s)0+ pec S1(3)0/a PLAS+P.	**pecEo** Fig. 120 p. 803
NGC 7600 MCG -01-59-019		23h18m53.83s -07d34m49.8s 3436	S0- S01(5) .L..-./	**pecEo** Fig. 120 p. 803
NGC 7609 MCG +01-59-047	ARP 150 VV 020a HCG 095A/C	23h19m30.30s +09d30m29.4s 11562	E3 and Sm .P.....	**TRIP+** Fig. 156 p. 835
  MCG +01-59-046	 HCG 95D	23h19m27.90s +09d29m39.6s 12350	Sc	**TRIP+** Fig. 156 p. 835
 CGCG 406-067 MCG +01-59-048	 HCG 095B	23h19m33.81s +09d29m41.6s 11637	Scd .S?....	**TRIP+** Fig. 156 p. 835
NGC 7617 UGC 12523 MCG +01-59-051a	 PEG I:04 	23h20m09.010s +08d09m56.52s 4172	SA0^0: .LA.0*.	**pecEo** Fig. 166, 117 p. 844, 800
 UGC 12498 MCG +01-59-042	 IC 5309 	23h19m11.70s +08d06m34.0s 4198	Sb .S..3..	**TRIP+** Fig. 166 p. 844
 UGC 12510 		23h19m39.37s +08d15m52.5s 3542	E .E.....	**TRIP+** Fig. 166 p. 844
NGC 7611 UGC 12509 MCG +01-59-049		23h19m36.60s +08d03m48.0s 3252	SB0+: .LB.+*.	**TRIP+** Fig. 166 p. 844
 UGC 12522 		23h20m16.6s +08d00m20s 2812	Sm: .S..9*.	**TRIP+** Fig. 166 p. 844
 KUG 2318+078 MCG +01-59-058		23h21m05.84s +08d06m09.7s 3886	SB? .SB?...	**TRIP+** Fig. 166 p. 844
NGC 7631 UGC 12539 MCG +01-59-060		23h21m26.70s +08d13m03.0s 3754	SA(r)b: .SAR3*.	**TRIP+** Fig. 166 p. 844
NGC 7626 UGC 12531 MCG +01-59-057		23h20m42.29s +08d13m02.5s 3405	E pec: E1 .E...P*	**pecEo** Fig. 117, 166 p. 800, 844

NGC 7619		23h20m14.40s	E	**pecEo**
UGC 12523		+08d12m22.0s	E3	Fig. 117, 166
MCG +01-59-052		3762	.E.....	p. 800, 844
		23h21m01.60s	Sb-c	**pecEo**
UGC 12535		+08d10m45.9s		Fig. 117, 166
		4214	.S..4..	p. 800, 844
NGC 7674	ARP 182	23h27m56.724s	SA(r)bc pec	**TRIP+**
UGC 12608	VV 343a	+08d46m44.53s		Fig. 155
MRK 0533	HCG 096A	8713	.SAR4P.	p. 834
NGC 7674A	ARP 182	23h27m58.80s	Sa	**TRIP+**
UGC 12608	VV 343b	+08d46m58.0s		Fig. 155
MCG +01-59-081	HCG 096C	8852		p. 834
		23h28m00.20s	Im	**TRIP+**
		+08d46m02.4s		Fig. 155
	HCG 096D	8975		p. 834
NGC 7675		23h28m05.920s	E2	**TRIP+**
UGC 12608		+08d46m06.94s		Fig. 155
MCG +01-59-083	HCG 096B	8616	.LXS-*.	p. 834
NGC 7714	ARP 284	23h36m14.098s	SB(s)b:pec;HII;LIN	**Sp^{+} – Sp^{+}**
UGC 12699	VV 051a	+02d09m18.58s		Fig. 63
MCG +00-60-017	MRK 0538	2798	.SBS3*P	p. 755
NGC 7715	ARP 284	23h36m21.80s	Im pec sp	**Sp^{+} – Sp^{+}**
UGC 12700	VV 051b	+02d09m23.0s		Fig. 63
MCG +00-60-018		2770	.I..9P/	p. 755
	ARP 295A	23h41m47.35s	Sc	**TRIP+**
	VV 034b	-03d40m03.2s		Fig. 159
MCG -01-60-021		6601	.S.5$P/	p. 838
	ARP 295B	23h42m00.92s	Sb pec:	**TRIP+**
	VV 034a	-03d36m54.4s		Fig. 159
MCG -01-60-022		6966	.S..3P*	p. 838
NGC 7769		23h51m03.88s	(R)SA(rs)b;HII;LIN	**Sp^{+} – Sp^{0}**
UGC 12808		+20d09m00.6s	S(s)bc	Fig. 74
	MRK 9005	4211	RSAT3..	p. 765
NGC 7771A		23h51m13.10s	n/a	**Sp^{+} – Sp^{0}**
		+20d06m12.0s		Fig. 74
		4101		p. 765
NGC 7771		23h51m24.85s	SB(s)a HII	**Sp^{+} – Sp^{0}**
UGC 12815		+20d06m42.4s		Fig. 74
	MRK 9006	4277	.SBS1..	p. 765
NGC 7771B		23h51m39.75s	n/a	**Sp^{+} – Sp^{0}**
		+20d02m19.3s		Fig. 74
		4300		p. 765
NGC 7769B		23h50m42.63s	n/a	**Sp^{+} – Sp^{0}**
		+20d17m11.1s	S(s)bc	Fig. 74
		4321		p. 765
NGC 7769A		23h50m42.64s	n/a	**Sp^{+} – Sp^{0}**
		+20d12m11.1s	S(s)bc	Fig. 74
		4314		p. 765