

The Evolution of Evolved Galaxies

Giuseppe Gavazzi

Università degli Studi di Milano - Bicocca, P.zza delle scienze 3, 20126 Milano, Italy

1 Introduction

The plethora of high redshift multifrequency surveys currently under way, that were extensively illustrated at this meeting will shortly provide us with a sequence of “fossil” galaxies, eventually disclosing the secret of their evolution, much as fossil organisms guided paleontologists tracing the evolution of species. Meanwhile we wish to remind to both theorists and to observers that the characterization of local galaxies, representing the boundary condition at $z = 0$ of any evolutionary model, is not yet fully achieved. With this purpose we conceived an extensive observational campaign aimed at providing the phenomenology of local galaxies in the broadest possible frequency range. We took observations and collected data from the literature for over 3600 local ($z < 0.03$) galaxies, mainly members to rich clusters, spending a large effort in making the literature data as homogeneous as possible with our own. The data cover the range from 2000 Å (UV) to the centimetric radio domain. The Web site “GOLDmine” (Galaxy On Line Database Milano Network) [10] is designed to provide world-wide access to this massive data-set on local galaxies.

2 GOLDmine

GOLDmine (<http://goldmine.mib.infn.it>) is focused on 9 local clusters of galaxies: A262 (Perseus-Pisces), Cancer, A1367, A1656 (Coma), Virgo, A2147, A2151, A2197, A2199 (Hercules). In addition it contains a filament of nearly isolated galaxies, the so called “Great Wall”, thus providing the ideal laboratory for comparative analyses of galaxies in different environments, spanning a factor of 20-100 in local galaxy density. Objects are selected in the above regions with strictly optical completeness criteria. Galaxies brighter than $m_p = 15.7$ are taken from the Catalogue of Galaxies and of Clusters of Galaxies (CGCG) by [14] in all clusters except Virgo where objects brighter than $m_p = 20.0$ are taken from the Virgo Cluster Catalogue (VCC) by [3]. Obviously, due to the factor of ~ 5 difference in distance between Virgo and the other clusters, this selection limit results in dwarf galaxies being included in our database only for the Virgo cluster. However globally GOLDmine covers the whole range (4 orders of magnitude) of luminosities spanned by real galaxies. GOLDmine contains 3649 galaxies.

Extensive campaigns were carried out to observe as many as possible of the 3649 target galaxies through all possible observational windows, a task that we did not complete yet.

The parameters listed in the GOLDmine database are divided into 5 categories: General, Continuum and Line photometry, Dynamical and Structural. They can be obtained from GOLDmine by querying the database for an individual galaxy name or “by parameters”, “by near name or position” or “by available images”. In this case all galaxies in a given range of photographic magnitude, and morphological type can be selected.

General parameters include Catalogue designations, (J2000) celestial coordinates, optical diameters, photographic magnitude, redshift, distance, morphological type.

Continuum parameters include: UV, U, B, V, J, H, K magnitudes computed at the optical radius (25^{th} mag arcsec $^{-2}$) (see [8]); IRAS 60 and 100 micron fluxes; radio continuum fluxes densities at 0.6 and 1.5 GHz.

Line photometry includes: the atomic (HI) and molecular (H_2) hydrogen mass; the $\text{H}\alpha$ + [NII] line equivalent width and flux.

Dynamical parameters include: the width of the HI line, with a quality flag; the width of the $\text{H}\alpha$ line and the central velocity dispersion.

Structural parameters include: the light concentration index (C31); the effective radius R_e ; the effective surface brightness μ_e ; the total asymptotic magnitude. These quantities (see [13]) are given separately for the H, V and B bands.

The novelty of GOLDmine consists of its image section, where images can be downloaded in JPG and FITS format. Images include:

Finding Charts from the Digitized Palomar Sky Survey for all galaxies.

Broad band images obtained in the B, V, H and K bands.

Narrow band images in the light of $\text{H}\alpha$ and a red image of the underlying stellar continuum near $\text{H}\alpha$.

RGB images. For some galaxies we combined several images to obtain “true” color pictures.

Radial profiles of the light distribution as obtained on the available (B, V, H) images (see [9]). When at least two radial profiles are available the color radial profile is also shown.

Optical spectra integrated over the whole surface of the galaxy, obtained in drift-scan mode, i.e. by drifting the spectrograph slit over the galaxy extension (see [11]).

Spectral Energy Distributions (SEDs) from the UV to the centimetric radio continuum obtained from broad-band photometry. The plotted data are total fluxes (extrapolated to the optical radii), unlike the individual aperture data given by NED. However they are given as observed, i.e. uncorrected for extinction from our Galaxy and for internal extinction (see [5]).

It is our goal to provide a homogeneous set of keywords in all FITS header to characterize the data, including: effective integration time, filter, telescope, WCS parameters, photometric effective zero point. This homogenization is not yet complete. Its progress will be detailed in the online “GOLDmine news” section.