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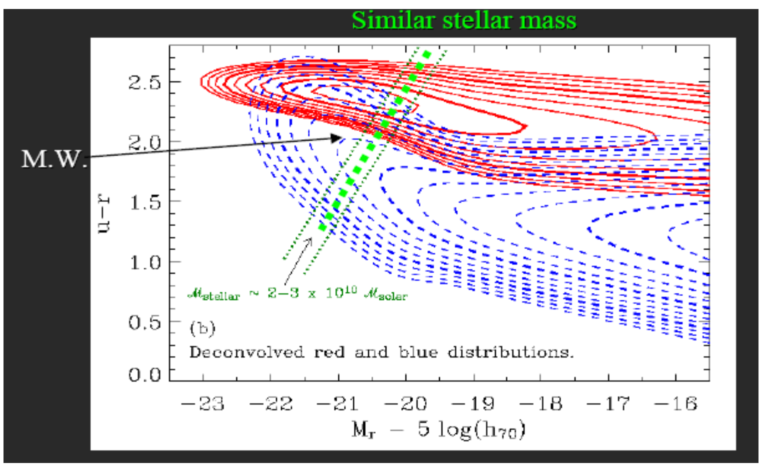
HI properties of nearby galaxies.

Silvia Fabello

Advisors: Guinevere Kauffmann, Barbara Catinella

The goal of this PhD thesis is to study the HI content and properties of a sample of nearby *massive* galaxies.
Galaxies divide into two families: in a color-magnitude diagram they define a blue cloud and a red sequence (see figure from Baldry et al. 2004). Schematically, the blue objects show typically high star formation rates and are HI rich; the red galaxies, with almost no on-going star formation, are HI poor. Being the fuel for future star formation, the neutral gas is clearly a fundamental element to understand how galaxies evolve from one family to the other. Observations show that the transition between the blue cloud and red sequence



happens at a stellar mass around $\sim 3{\times}10^{10}$ $M_\odot$ (Kauffmann et al. 2003, Baldry et al. 2004 - see figure).

In order to study the neutral gas content of these massive galaxies, I am going to use part of the GALEX Arecibo SDSS Survey (GASS) sample. GASS is a targeted HI survey on-going at Arecibo, specifically designed to understand the properties of transition galaxies. The GASS parent sample is made of ∼12000 nearby massive galaxies, selected requiring redshift $0.025<z<0.05$ and stellar mass around the transition limit ($10< \log M_\odot <11.5$), plus their location within the intersection of the footprints of the following surveys: the Sloan Digital Sky Survey (SDSS - optical data), the Galaxy Evolution Explorer (GALEX - UV data) Imaging surveys and the Arecibo Legacy Fast ALFA Survey (ALFALFA). ALFALFA is an on-going multi-beam blind survey at Arecibo, which will map the 21 cm radiation of $\sim$ 7000 deg^2 of the sky.
The sample for my work will be composed of the HI poor objects in the GASS parent sample that are non-detected by ALFALFA (which has low sensitivity); we expect that such sample

will be biased toward early type galaxies, which are usually HI poor.
It is possible to learn about the average HI content of non-detected galaxies by co-adding their signal: the stacking process (co-adding the signal) will be performed on HI spectra of non-detected galaxies with similar physical properties, like e.g. same morphology, stellar mass. With this technique it is possible to obtain useful constraints on the HI content of objects for which HI data are not available. The stacking of ALFALFA data will be performed by modifying already existing IDL tools developed by the ALFALFA team; I will build an IDL software tool to extract HI spectra at a given position and redshift from the ALFALFA data-cubes, and to stack such spectra (the IDL stacking tool will became part of the ALFALFA standard tools). The first step is to check the IDL tool by extracting a few spectra at given position and redshift corresponding to galaxies already detected by ALFALFA, and compare the HI profiles.

As soon as the IDL tool is ready, I can start the scientific analysis on data. In fact, ALFALFA has already observed and cataloged $\sim$ 1600 deg^2 of the spring sky (between 7h30m$<$RA$<$16h40m and 04deg $< \delta <$16deg, including the Virgo cluster); so I will start the analysis on the SDSS galaxies undetected in HI included in this ALFALFA region. Examples of possible analysis are: *i)* extracting the SDSS elliptical galaxies identified in the Virgo region and stacking their signal, both inside and outside the cluster. Evaluating their HI average content and comparing with the GASS results. *ii)* Extending the previous analysis to different environments and morphological types. *iii)* By binning galaxies with similar colors (corrected for extinction), comparing the average HI of red sequence and transition galaxies at fixed stellar mass.