The optical properties of Galaxies seen by Planck

Astrophysics, Imperial College London
Adam Young, Supervisor: Dr Clements

Introduction

When plotted on a colour verses absolute magnitude diagram galaxies in optically selected surveys form two distinct groups, the blue cloud and red clump with a lack of galaxies between them in the green valley. IR selected galaxy surveys have show a different distribution, with the majority in a green mountain.

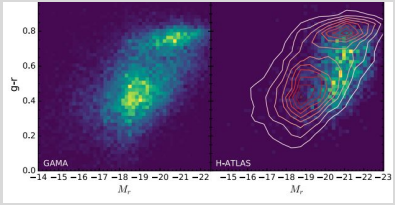
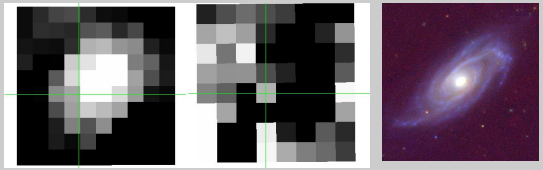


Figure from Eales (2018) showing colour magnitude plots for an optically selected (GAMA) and IR selected (H-ATLAS) galaxies. IR selected galaxies fall within the ‘green valley’ region with fewer galaxies in the optical sample.

-Malmquist bias leads to brighter objects being preferentially detected
-Galaxies selected at different wavelengths may have differing properties
-Optical luminosity in galaxies primarily due to stars
-Sub-millimeter luminosity primarily due to cold dust

Method

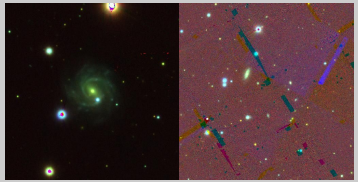
Used data from the Planck satellite at 857GHz to obtain a sub-millimeter(350μm) selected sample of nearby galaxies, which where matched to IRAS FSC for better positional accuracy to identify optical counterparts.



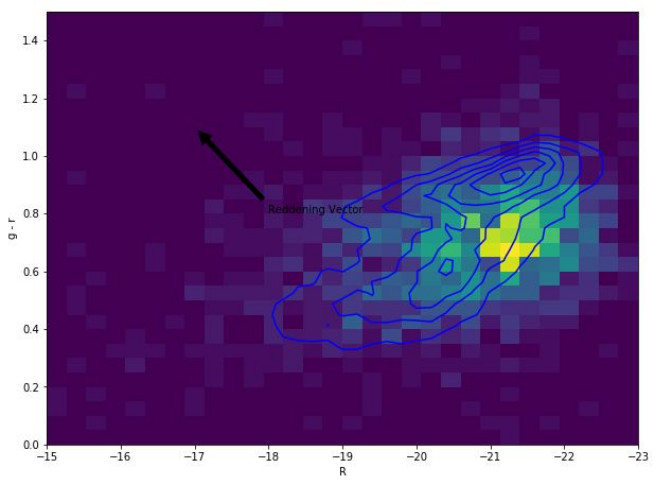
Images of NGC 0497, left: Plank 857GHz, middle:IRAS 25μm, right PanSTARRS optical. Crosshairs show position of IRAS source

Galaxies blended with foreground stars identified using Gini coefficient of pixel brightness, and images with defects where removed.

Left: Image of UGC 01347 blended with foreground stars, Right: Image of IRAS 04319-2937 containing many defects



Results



Colour magnitude diagram of sub-millimeter selected galaxy sample. Contours from SDSS in blue for comparison to optical sample. The sum-mill peak is in the optical ‘green valley’, and at a similar magnitude to the red clump. A reddening vector is plotted showing the effect of increasing dust attenuation.