Gas & Galaxy Evolution
*ASP Conference Series, Vol. **VOLUME**, 2000*
J. E. Hibbard, M. P. Rupen and J. H. van Gorkom, eds.

The Gas Content and Stellar Population of Red Low Surface Brightness Galaxies

K. O'Neil

Arecibo Observatory, HC3 Box 53995, Arecibo, PR 00612; koneil@naic.edu

Abstract.

Recently the first sample of red low surface brightness galaxies was found. It can be seen that these galaxies have similar properties to their blue counterparts, including both high and low gas mass-to-luminosity fractions, central surface brightnesses, etc. In this poster we present recent results of our studies of these enigmatic systems, including neutral hydrogen content and multi-band photometry. We also discuss the recent discovery that one of the presumed red LSB galaxies may in fact be the central galaxy in a distant (z = 0.21) galaxy group.

1. The Red LSB Galaxies

In a previous survey (O'Neil, et.al. 1997a, 1997b) we discovered the first sample of red low surface brightness galaxies. Although the number of known red LSB galaxies is still low (10% of the O'Neil, et.al. sample, or 12 galaxies have (B - V) > 1 or (V - I) > 1.5), already it can be seen that these galaxies have similar properties to their blue counterparts, including: central surface brightnesses ranging from 22.2 – 24.5 B mag arcsec^{-2}, scalelengths varying from $4''$ – $10''$, and inclinations from $20°$ – $68°$. Only two of the red LSB galaxies in the O'Neil, et.al. sample have been detected at 21cm – P05-5 which has a velocity of 3117 km/s and total H I mass of $0.63\times 10^8\ M_\odot$, and C05-3 which has a velocity of 12942 km/s and total H I mass of $26\times 10^8\ M_\odot$. The other 10 galaxies were not detected in the 0 – 25,000 km/s range to limits of 1.0 – 1.5 mJy (O'Neil, Bothun, & Schombert 2000).

2. P06-5

In their recent catalog of bright X-Ray sources from the ROSAT Survey, Voges, et.al. (1999) discovered a strong X-Ray source lying at the same coordinates as [OBC97] P06-5. A follow-up study undertaken by Wei, et.al . (1999) to obtain spectroscopic redshifts of the bright active galactic nuclei in the ROSAT survey found P06-5 to have a redshift of z = 0.21. These results suggest that, unlike the other galaxies discussed in this poster, P06-5 is a part of a distant galaxy group associated with the X-Ray emission found by the ROSAT survey. With this thought in mind, a re-analysis of both the data from O'Neil, et.al (1997a,

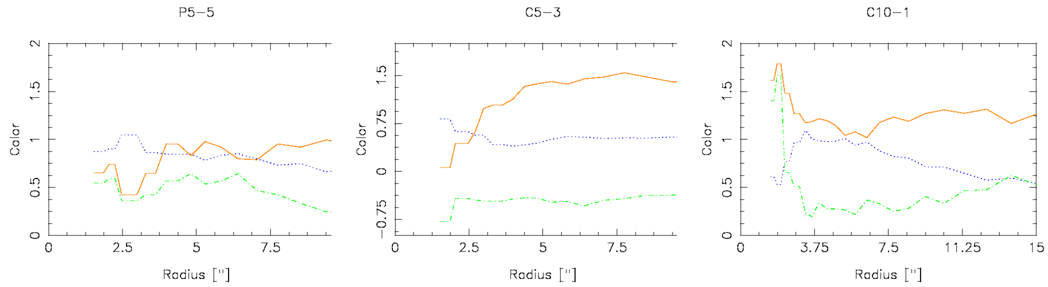

Figure 1. Examples of the color profiles for three of the galaxies with $\mu_B(0) > 23$ mag arcsec^{-2}. The dotted, solid, and dash-dotted lines are the $B-V$, $V-I$, and $U-B$ colors, respectively.

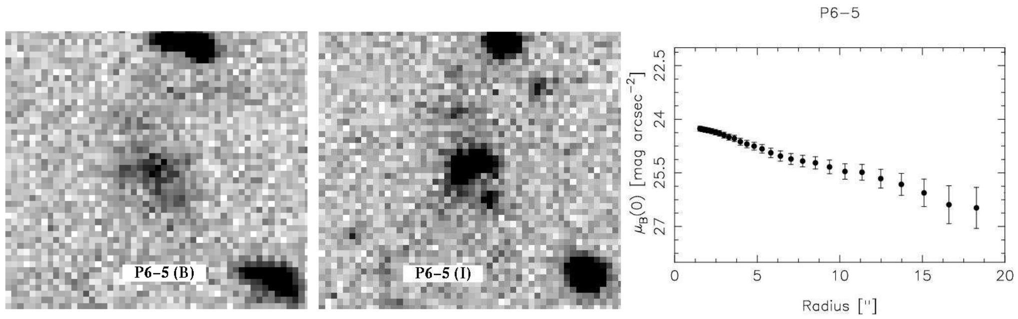

Figure 2. It is very likely the annuli used to determine the color and surface brightness profiles for P06-5 included more than one galaxy, yet the distant nature of the P06-5 galaxy group resulted in the profiles merging into what is shown above. No k-correction has been applied to this data.

1997b) and the digital POSS plates show what may be the other members of the P06-5 galaxy cluster (see Figure 2).

The obvious question, then, is - Are any of the other red low surface brightness galaxies also distant (z > 0.1) objects? Comparing both the color and local environment of P06-5 with the other galaxies discussed in this poster shows P06-5 to be unique, both in having a considerably redder color than the other galaxies and in having a number of small, bright, extended objects nearby. Additionally, as two of the red LSB galaxies from the O'Neil et.al. survey have been detected at 21-cm and shown to lie at v < 13,000 km/s, makes it quite likely that P06-5 is unique in its status as a background galaxy group.

References

O'Neil, Bothun, & Schombert 2000 AJ 119, 136

O'Neil, Bothun, & Cornell 1997a AJ 113, 1212

O'Neil, et.al. 1997b AJ 114, 2448

Wei, Xu, Dons, & Hu 1999 A&AS 139, 575

Voges, et.al. 1999 A&A 349, 389