Formation and Evolution of Galaxy Bulges
Proceedings IAU Symposium No. 245, 2007
M. Bureau, E. Athanassoula & B. Barbuy, eds.

doi:10.1017/S1743921308017377

Tidal interactions and mergers in compact groups

I. Plauchu–Frayn[1] and R. Coziol[1]

[1]Departmento de Astronomía, Universidad de Guanajuato, Callejón Jalisco s/n, Valenciana, Guanajuato, Gto., México.
email: plauchuf@astro.ugto.mx, rcoziol@astro.ugto.mx

Abstract. Based on a NIR morphological study of 25 galaxies in eight Compact Groups (CGs), we find that the galaxies are not in equilibrium but in a process of transformation: late-type galaxies morphological change into earlier types. As much as half of the galaxies in our sample show evidence of ongoing or past mergers.We identify tidal stripping and mergers as the process responsible of this transformation. Our observations also suggest that galaxies in CGs merge more frequently under "dry" conditions (i.e. once they have lost most of their gas).

Keywords. galaxies: evolution, galaxies: formation, galaxies: interactions

---

Observations were carried out with the 2.12m telescope of the Observatorio Astronómico Nacional, located in Baja California, México. Using the IR Camera CAMILA, we obtained images in J and K' bands with average integration times of 3600s and 900s, repectively. We perform independently two different analyses: an isophotal study and a study of morphological asymmetries. For a full description of the observations, data reduction and analysis see Coziol & Plauchu–Frayn (2007).

For the first time, it was possible to verify that the variations of the parameters of fitted ellipses in galaxies reflect inhomogeneous stellar mass distributions. In figure 1 we show the isophotal and asymmetry analyses for one galaxy. The asymmetries seen in the residual image appear as structures in the A/A_{max} curve (Fig 1a) and produce the variations in the isophotal paremeters (Fig 1b). 74% of the galaxies in our sample present evidence of asymmetries related to interactions. More than a half of these asymmetries come in pairs. The symmetric galaxies are generally small in size or mass and inactive. They may have already lost their gas and least attached envelope of stars to their more massive companions. A high frequency (36%) of early-type galaxies show a flat or positive color gradient (see J-K' color diagram in Fig. 1b), which is consistent with evidence of past mergers. The high fraction of early-type galaxies with no activity found in our sample suggest they are merging under dry conditions.

The scenario we propose for the evolution of the groups is the following: first galaxies lose their envelope of gas through galaxy-group interactions and then start merging with each other under dry conditions. Based on our data, the possibility that all the galaxies in one CG will merge to form one giant elliptical galaxy cannot be rejected. The first CGs to reach complete evolution are probably located in massive and dense environments like clusters of galaxies. This would explain why we do not see "isolated" elliptical galaxies as the product of CG evolution. If galaxies found today in clusters first evolved in groups, our results would suggest that the segregation of galaxy morphologies observed in clusters today is mostly a product of tidal interactions and mergers.

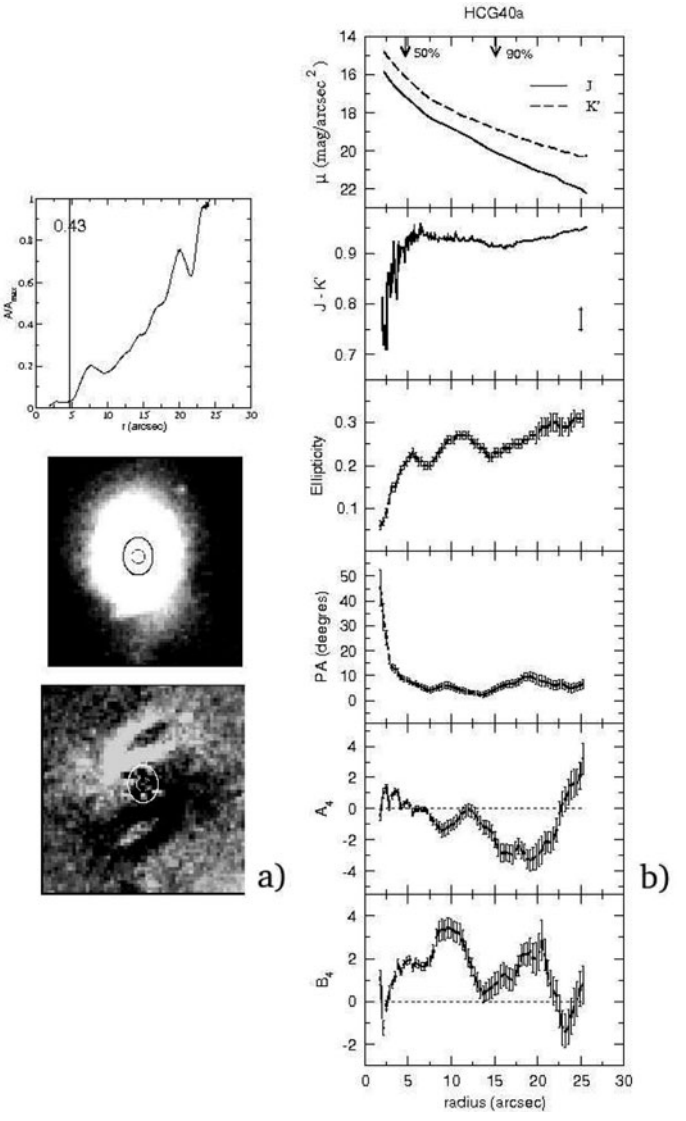

Figure 1. Analysis for one of the galaxies in the sample: HCG 40a (*a*) Asymmetry analysis: The graphics on the top give the asymmetry intensity (A/A_{max}) at different radii. The vertical line indicates the radius containing 50% (r_{50}) of the total light. The image in the center is the original image cleaned (as much as possible) of foreground objects. The inner circle is the size of the PSF, and the ellipse is at isophote r_{50}. The image on the bottom is the residual image obtained by subtracting the rotate image from the original. The two images are shown at the same scale (north up and east to the left); (*b*) Isophotal analysis: The graphics show, from the top to bottom, the surface brightness profiles (J and K'), the color profile (with typical error bars), and variations with radius of the ellipticity, position angle, and four-order Fourier coefficients. The two arrows in the upper graph indicate the r_{50} and r_{90} radii.

Reference

Coziol, R. & Plauchu–Frayn, I. 2007, *AJ* 133, 2630

https://doi.org/10.1017/S1743921308017377 Published online by Cambridge University Press

Figure 1. Andrea Cattaneo and SOC member Matthias Steinmetz discussing during a coffee break.

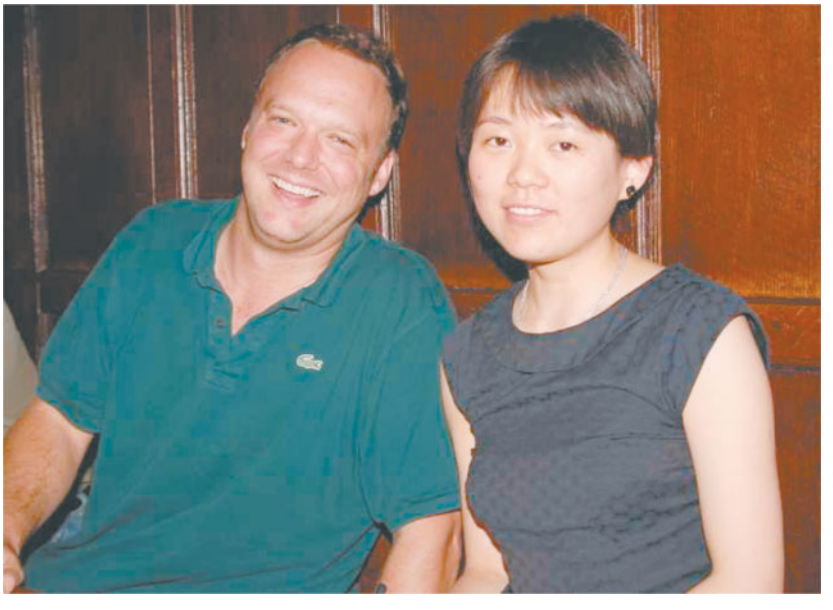

Figure 2. Thorsten Naab and LOC member Mimi Zhang during the symposium dinner.

https://doi.org/10.1017/S1743921308017377 Published online by Cambridge University Press

Figure 3. Peter Erwin, Niv Drory and Giuseppe Aronica discussing during a coffee break.

Figure 4. From right to left, Thorsten Naab, Elad Zinger, Avishai Dekel, LOC member Michael Williams and John Kormendy during the symposium dinner.

https://doi.org/10.1017/S1743921308017377 Published online by Cambridge University Press

Figure 5. From right to left, Arjen van der Wel, Tom Dwelly, Robert Zylka and Michael Rich during the symposium dinner.

Figure 6. Habib Khosroshahi and Elena D'Onghia discussing during a coffee break.

https://doi.org/10.1017/S1743921308017377 Published online by Cambridge University Press

Figure 7. Naoteru Gouda, Takuji Tsujimoto, John Lucey, Matthew Colless, Eva Schinnerer and Witold Maciejewski during the symposium dinner.

Figure 8. Alessandra Beifiori and LOC member Marc Sarzi showing off with the microphones. Avishai Dekel, Sadegh Khochfar and Dimitri Gadotti are visible in the background.

https://doi.org/10.1017/S1743921308017377 Published online by Cambridge University Press