

Photometry of dwarf galaxies in the Coma cluster

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Dwarf galaxies
in the Coma
cluster

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- Reynier Peletier (supervisor, Kapteyn)
- Edwin Valentyn (Kapteyn)
- David Carter (Liverpool)
- Marc Balcells (IAC)

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COMA ACS Survey:

- Survey will cover 740 sq. arcmin in the F475W and F814W bands
- The areas selected cover both the core and infall region of the cluster.
- Resolution 0.1" (50 pc at 100Mpc)
- F814W (best passband) and F475W filters
- Point sources detected at 10σ up to $B=27.6$, $I=26.8$

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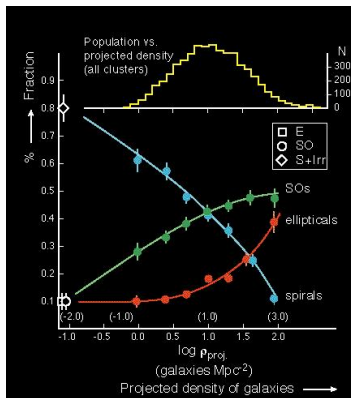
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Dwarf Ellipticals (dEs)

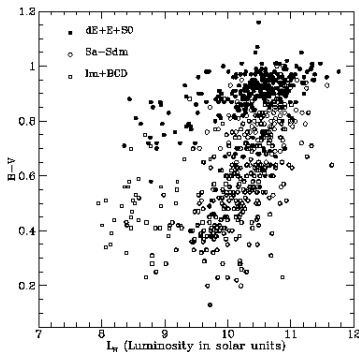
- $M_B > -18$
- Smooth surface brightness profiles
- dEs are different from Es: lower sersic index
- Evolution dlrr \rightarrow dE ?

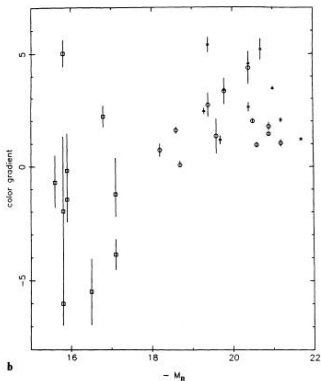
- Relation between morphological type and density in clusters
- dEs are either preferentially born in high density regions or the density plays a role in the evolution



Dressler
1980

- Colour-magnitude relation: bright spheroidal galaxies are redder
- Usually interpreted as metallicity effect
- For dwarf galaxies, slope may change and scatter increase.





Colour gradients:

- Due to metallicity/star formation history differences
- Commonly seen in dwarf galaxies
- Outer regions usually redder (Vader 1988)
- Sometimes gradient inverted (Van Zee, 2004)

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- When and where in this cluster environment did stars form
- Does the scatter in the CMR relate to distance from cluster center
- ... or other galaxy parameters
- How many dwarfs have blue nuclei and what is the distribution in the Coma cluster

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We want to have accurate photometry of dwarf galaxies:

- Data have been reduced (outside Astro-Wise)
- Determine sky
- Smooth images from different bands to same resolution
- Fit profiles using GalPhot (and GalFit)

Sky has already been subtracted when images are ingested. Because areas are very crowded, sky is usually overestimated by conventional methods.

- Define a grid of boxes
- Use sourcelists to flag out sources
- For each box, determine median, and throw out outliers $> 2\sigma$
- Iterate this for each box

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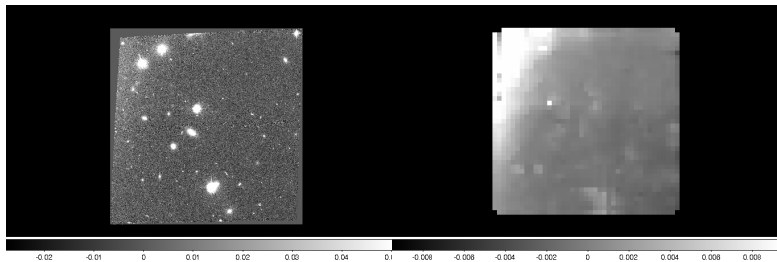
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- Use TinyTim to generate PSFs for both bands
- Convolve each band with the PSF of the other band (this is a waste of resolution: may actually smooth away nuclei)
- Need something like a ConvolvedFrame that we can feed to GalPhot

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- We modified GalPhot code such that we can keep positions fixed between different bands
- Probably modify GalPhot code (in the future) such that we can set ellipticity and position angle at fixed values
- Can run GalPhot parallel at dpu

Example: Metallicity gradient

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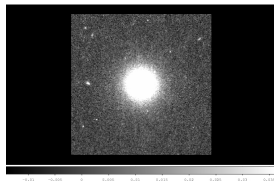
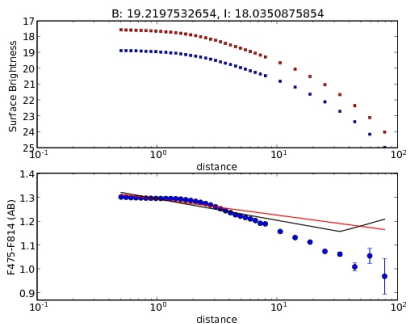
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Galaxy with blue nucleus?

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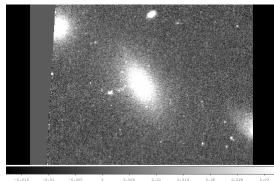
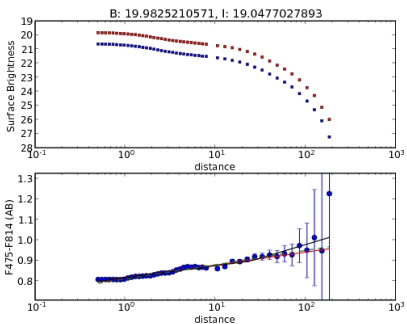
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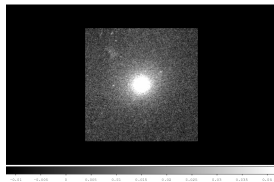
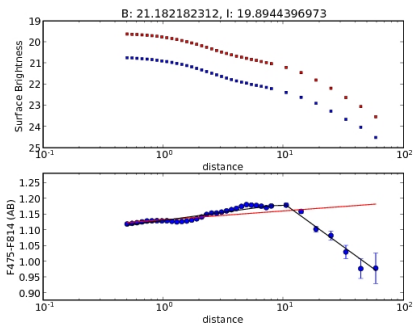
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Galaxy with blue nucleus? (!)

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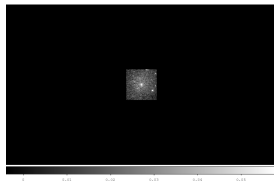
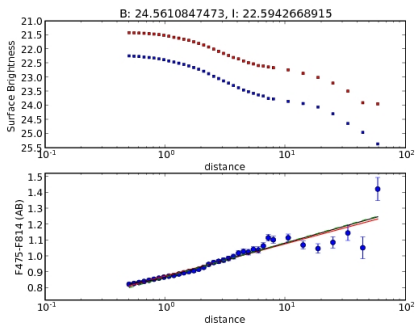
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Galaxy with blue nucleus?

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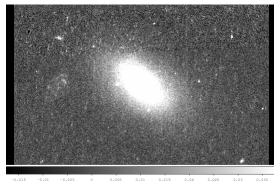
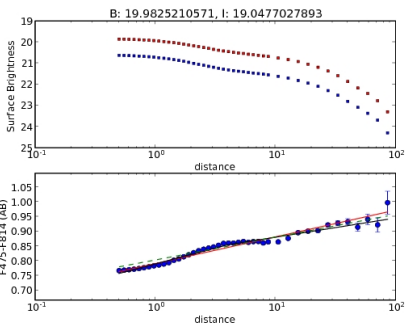
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Galaxy with red nucleus?

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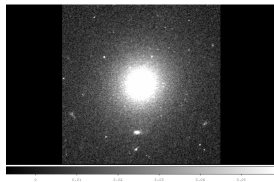
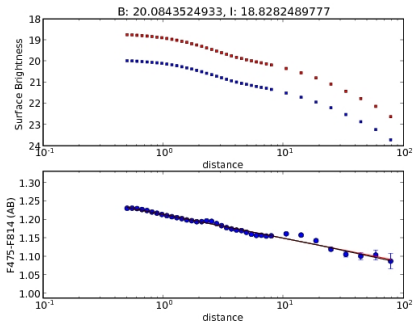
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- Determine colour gradients for all galaxies (using GalPhot)
- Use GalFit to determine galaxy parameters