DETERMINATION OF YOUNG POPULATION AGES IN CLUSTER GALAXIES

B.M. POGGIANTI AND G. BARBARO
Department of Astronomy
vicolo dell'Osservatorio 5, 35122 Padova - Italy

The "Butcher–Oemler" effect was originally defined as the excess of blue galaxies observed in distant rich clusters when compared to local counterparts. Subsequent observations revealed that a larger fraction of objects in clusters between $0.1 < z < 1$ show signs in their spectra of the presence of young stars, i.e. of a recent (during the last 2 Gyrs) or current burst of star formation.

It is fundamental to identify the observable quantities that indicates the presence of stars of different ages: emission lines, such as [OII]3727 and $H\alpha$; optical colours, such as UBVRI in the Johnson's system or other photometric systems; Balmer lines in absorption, such as $H\delta$; UV colours, such as (1550-V); the D4000 break; other spectral indices and lines. An evolutionary synthesis model is employed in order to determine these observables in three sets of models: spirals of various Hubble types in which star formation has been arbitrarily stopped at different times with respect to the moment of the observation; ellipticals with a burst ended at least 0.5 Gyr ago in which the quantity of gas involved in the burst is varied; ellipticals with a more recent burst that took place between 50 and 300 Myrs ago.

A strong equivalent width of $H\delta$ in absorption is the sign of the presence *on the main sequence* of type A stars and therefore indicates recent star formation. Blue and very blue colours, such as (U-B), (U-685) or (1550-V), depend on the current or the most recent episode of star formation, therefore are sensitive to a wider range of stellar ages than $H\delta$. A good correlation exists between these colours and $H\delta$ only for truncated spirals and ellipticals with an old burst. In the case of the recent bursts, where stars younger than 0.2 Gyr affect the colour, but not yet the $H\delta$, a spread is found in the relations between blue colours and the Balmer line, while a tight correlation exists between $H\delta$ and the colour (V-K).

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