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SHAKEN, NOT STIRRED - THE BCG STARBURST RECIPE

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True starbursts are dramatic events that lead to a rapid exhaustion of the available gas supply and generate massive outflows of gas, strongly influencing the evolution of galaxies. To understand the early phases of galaxy evolution it is therefore crucial to identify the mechanisms that rule this process. In this study we present observations that show that interactions are inefficient to generate starbursts and that mergers appear to be a more plausible mechanism.

It seems that a necessary condition for a starburst to occur is an increased gasflow into the central region. One possibility is that tidal forces generate torques between gas and stars that set the gas in motion. Another possible triggering mechanism is a direct merger between two galaxies resulting in gas cloud collisions. A third possibility is reaccretion of gas that once was expelled from the galaxy in a previous burst.

We have carried out a spectroscopic/photometric study of a magnitude-limited sample of interacting and merging galaxies and a comparison sample of isolated galaxies [1]. Contrary to results from many previous studies, often hampered by selection effects, we find no significant effect on the colours that could support a major increase of the *global* star formation rate (SFR). In the centre however, we find a moderate increase of the SFR of 2-3 in the mean. "True" starbursts however, i.e. those that play a major role in the evolution of a galaxy, are rare. We therefore conclude that interaction via a close encounter is not an efficient triggering mechanism.

To further elaborate on the starburst mechanism we study metal poor BCGs. These are ideal test objects since they represent clear-cut starburst cases. As an on-going project we carry out Fabry-Perot mapping of the central gas kinematics and obtain images in optical and near-IR of a fairly large number of BCGs and Irr galaxies [3,4]. The central velocity fields are found to be highly irregular as a consequence of superwinds triggered by SN explosions and/or a current merger process.

An important task is to identify the morphological type of BCGs before they entered the bursting stage. The gaseous/stellar content and gas metallicities of the most extreme BCGs are only comparable to LSB galaxies. This indicates that this type is in some way involved. But there are other properties that do not agree with those of LSBGs, e.g. that BCGs may contain a large number of globular clusters, quite unlike what is observed in LSB galaxies. This problem may be resolved however, since we find that globulars are formed in the starburst [5].

Another property that differs between LSB and BCGs is the halo. Our deep optical/near-IR photometry of 4 luminous BCGs reveal a very red halo colour, most of which we think originates from stars. The colours are best matched (e.g., [6]) by high ages and, quite surprisingly, high metallicities [2], as if the galaxies were much more massive than what the widths of the emission lines indicate. If confirmed, a high metallicity gives a strong support of a merger between a gas rich metal poor (LSB?) galaxy and a more massive dark matter dominated low luminosity galaxy. Recent FUSE data of one of these BCGs, Haro 11, show broad Lyman lines in absorption. The lines have a slight asymmetry, indicating outflows. But the large width of the lines cannot be explained by outflows alone, since high velocities on the redshift side of the systemic velocity are also observed. One interpretation is that these high velocities originate from neutral gas clouds in violent relaxation around a high mass object. If so, these luminous BCGs may represent the early stages of intermediate mass ellipticals in the making.

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