

# **The Physics of Quenching Massive Galaxies at High Redshift**

## **6 – 10 November 2017 @Oort**

### Descriptions and Aims

The subject of the workshop was to review the long-standing question of what shuts off star formation in massive galaxies, a phenomenon called "galaxy quenching". The scientific aim was to define the most pressing and important questions to distinguish between different hypotheses on quenching. Our goal as organizers for the workshop was to gather and promote collaboration among observers and theorists from various sub-fields including stellar populations, interstellar medium, and active galactic nuclei.

### Format

Everyone was given an opportunity to present their work in a talk of at least 15 minutes. The talks were interspersed with discussions of different formats, including plenary and group discussions. The program was split into roughly 40% discussion and 60% talks (including questions; actual time devoted to talks was therefore less than 50%). Furthermore, talk sessions were never longer than 70 minutes, and ample time was reserved for coffee and lunch breaks. As a result, the workshop was characterized by a very high degree of interaction among the participants and a relaxed, informal atmosphere.

Before the workshop we asked the participants to fill out a short survey where they were asked "What questions do you wish to see addressed in the workshop?", "What do you think is the most controversial issue concerning galaxy quenching?", and so on. We presented the results in the opening talk of the workshop and used them to guide some of the discussion sessions. We also invited the participants to contribute further questions to feed the discussion sessions using Post-It's and the "Magic White Paper" that we hung on the blackboard.

One afternoon we broke down into 6 groups of 8 people at random, and asked each group to formulate an observational test of galaxy quenching. It gave participants the chance to meet and discuss with researchers from other sub-fields. On another occasion the groups were organized by topics, which were proposed and voted for by the participants. On the last day, we invited five senior researchers to provide their view on the most pressing questions regarding a topic of their expertise. All of the discussion sessions were well-received and interactive, and we recommend this format to be used more often in academic workshops.

### Scientific Developments and Aha-insights

- During the group activity participants came up with observations which would be helpful for studying quenching, e.g. getting better age estimates of quenching galaxies using the far-UV, and getting strong upper limits on the gas mass of high redshift quiescent galaxies, hot gas observations of halos of quiescent galaxies, etc.
- While many quenching mechanisms are in circulation, there is no clear observational discriminant thus far to distinguish them.
- Molecular gas observations for quiescent galaxies are becoming available, but none of the quenching mechanisms so far can make predictions about this.
- The terminology of quenching is confusing and inconsistent. Many expressions (such as morphological quenching, environmental quenching, halo quenching) are used to indicate completely different mechanisms by people in different fields.
- Perhaps the most important result of this workshop was the realization that we are still very far from reaching a consensus view of galaxy quenching. Theorists and observers were equally surprised to realize that no consistent scenario has emerged yet; furthermore the very definition of quenching is still a matter of debate.

The workshop was well-received by many participants. Many participants expressed that they learnt a lot from colleagues who work in different sub-fields. They also appreciated the open, respectful and informal atmosphere throughout the workshop. Among the 63% of the participants who completed the post-workshop survey, a vast majority gave the top rankings

to the scientific value of the workshop, the quality of the discussions, and the extent of inspiration to the research. Several participants expressed that it was the best astronomy conference they have been to, and the organizers were asked multiple times if a similar workshop will be organized again.

The Lorentz Center provided an ideal venue and the administrative support for this workshop. The offices, the coffee room, and the blackboards around the centre provide suitable venues for informal interactions.

**Organizers**

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