

## Formation of stars and star clusters

**Richard Wunsch**<sup>1</sup>

<sup>1</sup>*Astronomical Institute, Czech Academy Of Sciences, Prague, Czech Republic*

Star formation is a part of the star-gas cycle, which is the most prominent process occurring in the baryonic matter in the Universe, and which also drives the evolution of galaxies. Despite large efforts during the last several decades, the star-gas cycle and in particular star formation, are far from being well understood.

Stars form out of the interstellar gas, specifically out of its dense molecular phase which consists of clouds with masses from hundreds to millions solar masses. Therefore, most stars form in clusters, though the majority of clusters do not survive as gravitationally bound objects on cosmological time-scales, and disperse instead into galactic field stars.

The star formation process is generally rather inefficient. Only a small fraction of the molecular cloud is transformed into stars, while most is heated and removed by the energy released by newly formed stars. Most of this energy is produced by massive stars, in the form of their ionising radiation, stellar winds and supernova explosions. In this way, massive stars provide negative feedback to star formation, limiting and quenching it by the destruction and removal of the molecular gas.

On the other hand, the energy of massive stars also re-shapes the interstellar gas in their nearby (and in some cases more distant) neighbourhoods, collecting it into dense shells, filaments and other structures. These structures may become places of new star formation themselves, and in this way the feedback can also be positive.

Massive stars may also be responsible for the origin of multiple stellar populations found in globular clusters, an unsolved puzzle related to the formation of massive star clusters. Furthermore, the hot gas created by massive star clusters escapes out of the galaxy in the form of large-scale outflows. This forms galactic fountains helping to enrich the galactic interstellar and halo gas with heavy elements, and in the case of starburst galaxies, it forms a super-galactic wind.

In this review talk, I shall discuss recent progress in the field of the formation of stars and star clusters, focusing on massive stars and massive clusters and their role in driving the star-gas cycle in galaxies.