

## **How Galaxies Get Their Gas**

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**Abstract** There are two ways that a galaxy can increase its stellar mass, either by accreting a smaller existing galaxy that already contains stars or by converting some of its gas into stars. The global average of this second process gives rise to the Madau plot, the star formation history of the Universe that is observed to decline at low redshift. Where does this gas come from? Once again it has two sources: the accretion of smaller galaxies that contain gas or the smooth accretion of gas not in galaxies. I will use hydrodynamical simulations of a Lambda dominated CDM Universe to investigate these issues. Perhaps suprisingly, most material enters galaxies through smooth accretion and not through merging. It is commonly believed that gas is shock heated to the virial temperature as it enters a dark halo and that the rate that smooth gas accretes onto the galaxy is regulated by the cooling time from the virial temperature. I will show that there are actually two channels by which gas can smoothly accrete onto a galaxy: the standard one just mentioned and one where the gas remains cool and its accretion rate is dominated by dynamical processes. It is this second process that dominates overall, particularly at higher redshifts. The relative importance of these two channels might help to explain both the shape of the Madau plot and the density morphology relation.